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THE MONTHLY BU

VOLUME II

No. 6

DEVOTED TO THE DESCRIPTIONS, LIFE HABITS AND METHODS OF CONTROL OF INSECTS, FUNGOID DISEASES AND NOXIOUS WEEDS AND ANIMALS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE AND HORTICULTURE.

EDITED BY THE ENTIRE FORCE OF THE COMMISSION UNDER THE FOLLOWING DIRECTORS:

CENSOR

A. J. COOK - - - State Commissioner of Horticulture, Sacramento

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HARRY S. SMITH - - - Superintendent State Insectary, Sacramento
FREDERICK MASKEW - - Chief Deputy Quaratine Officer, San Francisco
H. S. FAWCETT - - - - - Plant Pathologist, Whittier

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FRIEND WM. RICHARDSON, SUPERINTENDENT OF STATE PRINTING
SACRAMENTO, CALIFORNIA
1913

A NEW FRUIT AND TRUCK CROP PEST.

(*Irbisia brachycerus* Uhler.)

Order—Hemiptera. Family—Capsidæ.

By E. J. Vosler, Assistant Superintendent State Insectary, Sacramento, Cal.

The attention of the Insectary has been called to the injury of garden crops and fruit by a small shiny black plant bug about two tenths of an inch in length, belonging to that type of insects which sucks the

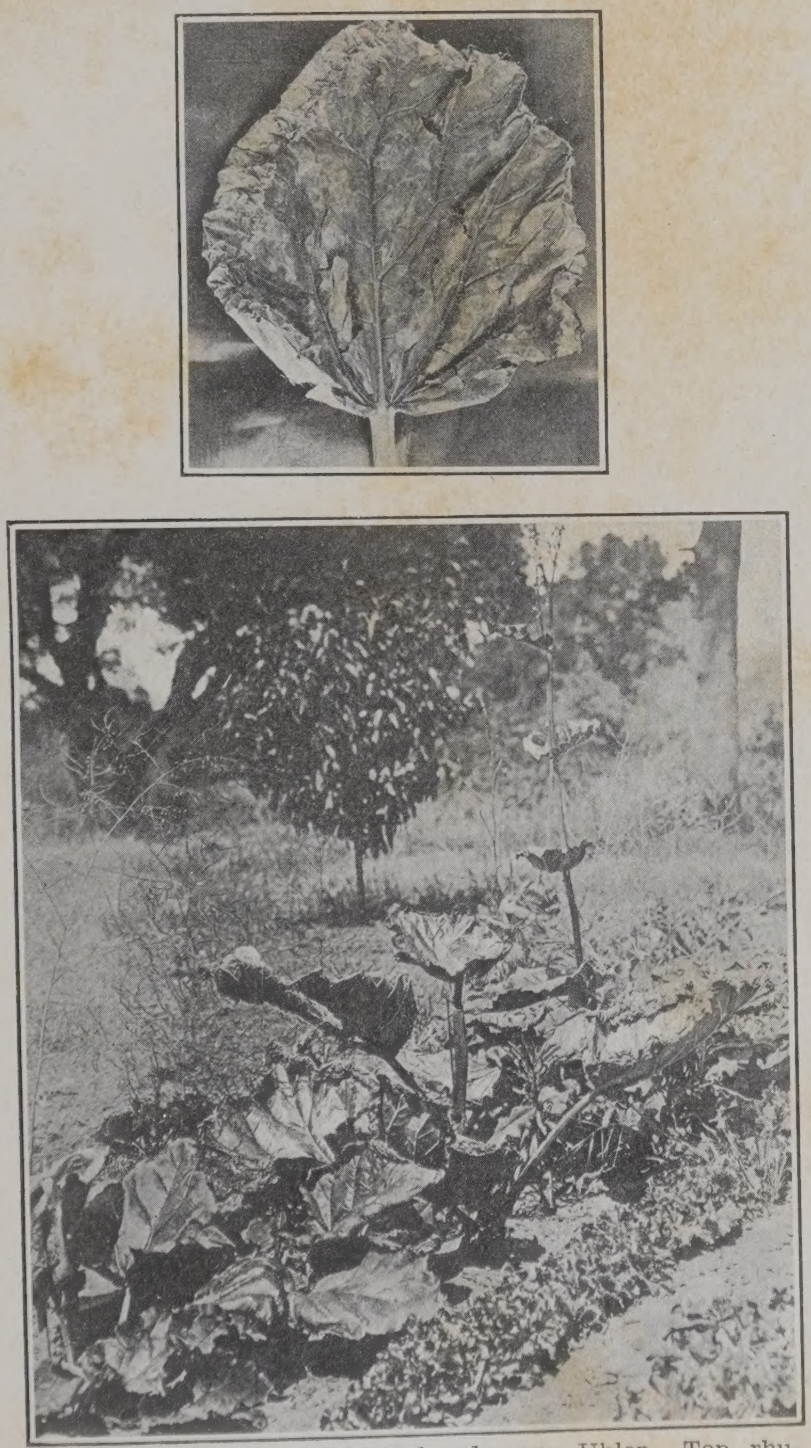

FIG. 331.—Work of *Irbisia brachycerus* Uhler. Top, rhubarb leaf damaged by the plant bug; bottom, rhubarb plants showing curled leaves due to the insect's attack. (Original.)

juices from the host plant with a sharp beak. Specimens were received from Mr. C. R. McBride, County Horticultural Commissioner of Solano County, with a report that they were doing serious damage to the fruit of peaches by puncturing the skin and causing the sap to ooze out. Complaint was also sent into the Insectary by Mr. Elmore Chase at Fairoaks that a small black plant bug was doing considerable injury to garden crops in his locality, and that the pest was spreading rapidly.

On visiting the infested territory I found that the insect was common on both the garden crops and on the weedy growth of the uncultivated

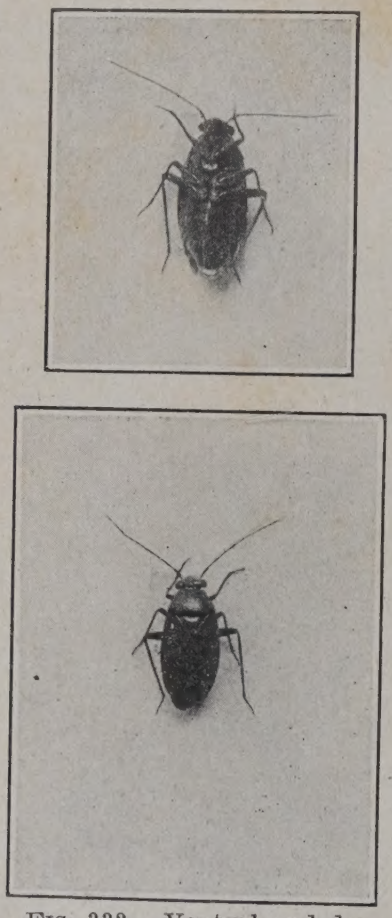

FIG. 332.—Ventral and dorsal views of *Irbisia brachycerus* Uhler. Enlarged twice. (Original.)

areas several miles from the damaged garden. Even the wild cucumber vines on the bottom near the American River had their share of the pest.

Of the vegetables in the infested garden, consisting of lettuce, radishes, onions and rhubarb, the radishes and rhubarb seemed to be the insect's particular favorites.

The rhubarb leaves were badly curled at the tips which were dead and the surfaces were streaked with dead discolored portions. Hundreds of the insects were found to be sucking out the juices of the host, for the most part, from the under side of the leaves. They were quite active and easily dislodged by shaking the plants but would soon crawl back up the stems and on to the leaves. The radishes were

almost entirely killed out. Roses in the neighboring garden presented a sorry appearance, nearly every flower having the tips of the petals blackened and dried from the vicious attack.

It was noted in connection with the examination of the injury done by the plant bug that no eggs or other immature stages could be found. This led to the conclusion that the insects had either migrated from natural food plants which had dried up, thus forcing them to look elsewhere in search of food, or that it was too early in the season for egg production to take place. Two weeks later the infested gardens were revisited and to my surprise the garden crops were entirely free from the pests, although here and there among the weeds and grasses of the adjacent land a few specimens could be obtained, lending further proof to the statement that the infestation was due to a migration caused by the drying up of its natural host.

From the fact that the insect was distributed over such a large uncultivated area at Fairoaks contact poisons are out of the question unless used frequently, because reinfestation would soon be the result. A repellent which would drive them away seems to be the solution of the problem, but unfortunately time and opportunity did not permit of experiment with the various methods of control. Possibly an application of Bordeaux mixture, which is considered a good repellent as well as a fungicide, light enough to prevent burning of the foliage, or lime, in the proportions of 25 pounds stonelime to 100 gallons of water and sprayed on the leaves will drive them away. Experiments will be conducted to determine the value of these sprays against this insect if it makes its further appearance.

Mr. E. P. VanDuzee has found this species to be common on grasses and weeds at San Diego, California, and has recorded it as being distributed over California, Colorado, Washington, Idaho, New Mexico and in the Wasatch Mountains of Utah. Mr. Otto Heideman records it as common on lupine and injurious to potato plants in this State.

This capsid was kindly determined by Mr. Van Duzee as *Irbisia brachycerus* Uhler. It has been recently redescribed as *Capsus solani* by Mr. Heideman.[1]

If the grower, who has noticed damage to his crops of a nature similar to that described in the preceding paragraphs, will take the trouble to send in a few specimens in a small vial or box to the Insectary, we will be glad to identify them and to make suggestions regarding experiments for their control.

[1]Proc. Ent. Soc. Washington. Vol. XII, No. 4, pages 200-201.

THE WALNUT MEALY BUG.

(*Pseudococcus bakeri* Essig.)

Order—Hemiptera. **Family—Coccidæ.**

By R. S. VAILE, County Horticultural Commissioner, Santa Paula, Cal.

In December, 1910, E. O. Essig published a description of a new mealy bug, to which he gave the name *Pseudococcus bakeri*. Because of its habit of feeding on the walnut trees in Ventura County it was given the common name of walnut mealy bug. Since that time the writer has collected additional specimens and data regarding the distribution of this insect which may prove of interest.

The known host plant list at present is as follows: Walnut, apple, pear, orange, lemon, pomelo, elder, cottonwood, southern California black walnut, nightshade and a few of the ornamental shrubs. It has been found in three localities in Ventura County infesting citrus trees, but in two of these cases it occurs in much greater numbers on the native elder and nightshade surrounding the trees. For at least a portion of the year it lives primarily on the roots of these two plants. Numerous solanum bushes growing under orange trees have been found with the roots thickly covered with all stages, from eggs to mature adults. The same has been true of the elder, though so far no specimens have been reported on roots of citrus or other fruit trees.

The life history appears to be much the same as that of *Pseudococcus citri* with this decided difference: the egg masses are much looser and the number of eggs laid by a single female is much less. This is quite a factor in the control of the insect, as it appears to have been present in certain orchards for a good many years without at any time becoming a damaging pest. Mr. J. J. Davis, in the *Entomological News,* XIX, No. 8 (1908), gives the average eggs of *Pseudococcus citri,* per mass counted, as 274 (twenty masses counted). Essig states, in commenting on this count, that under field conditions around Santa Paula (1909), the average was undoubtedly somewhat higher than this, reaching at least five hundred eggs for some individuals. He further states (P. C. Jr. Ent. II, No. 4) that practically all eggs of *Pseudococcus citri* seem to be fertile. The writer has counted the eggs in ten masses of *Pseudococcus bakeri* with a range from forty-two to a hundred and sixteen, and an average of sixty-seven eggs. In confinement in glass jars these appeared to be from ten per cent to twenty per cent unfertile. This may not hold true under field conditions, but we have observed in numerous old egg masses a few shriveled eggs unhatched. We have also seen appearances which lead us to believe that egg parasites play a considerable part in the control, but, so far, we have been unable to rear any.

From all observations to date we do not feel that *Pseudococcus bakeri* will ever properly be classed as a damaging insect, as it seems to require no additional control measures. We have not seen it in sufficient numbers to smut more than a very small percentage of the fruit nor have we seen it to have any noticeable effect on the health of the plant. Carbolic acid emulsion and other sprays which are effective against *Pseudococcus citri* are equally so against *Pseudococcus bakeri,* and fumigation seems much more efficient against the latter than the former species.

THE CORN WORM.

(*Heliothis obsoleta Hübn.*)

Order—Lepidoptera. Family—Noctuidæ.

By A. J. Cook, State Commissioner of Horticulture, Sacramento, Cal.

The corn worm, often known as corn-ear worm, less frequently as tomato worm, and again as cotton-boll worm (*Heliothis obsoleta*), is a serious pest in all parts of California. The moth lays the ribbed egg in spring. The pink, often darker, caterpillar—"worm"—enters at the silk end of the ear, and feeds on the growing kernels, causing pronounced furrows, and soiling the ear with its repulsive excrement. It feeds for near a month and reaches one and one half inches in length, when it enters the earth and pupates in an earthen cocoon, lined loosely with fine silk. The pupa is green at first, but soon becomes a bright brown. The moth which comes in a short time, in case of the summer brood, from the pupa varies in color and markings. It is generally yellowish or grayish and expands nearly two inches. Unlike most moths of the family *Noctuidæ,* it flies by day. There is a summer and an autumn brood.

As suggested in the common names, it feeds on the cotton-boll, the corn ears and the tomato fruits, though it eats sparingly of the leaves and stems, into which it bores. It is partial to corn, especially sweet corn, hence a remedy for the tomato gardener: By planting rows of sweet corn among the tomatoes, every tenth row should be corn, the moth is attracted from the less inviting tomato plants. The fondness of this insect for sweet corn attracts it to this plant, and the tomatoes escape. By dusting the silk of the corn with lead arsenate, or spraying with the same in water, two pounds to fifty gallons, we poison the caterpillar and save the corn. I have known the corn to be saved by careful hand picking. This in the garden, in a small way, is quite satisfactory.

NEMATODE WORMS AND MOTTLED LEAF.

By J. R. Hodges, Horticultural Inspector, Covina, Cal.

Having obtained consent of Mr. A. R. Meserve over a year ago to make an investigation of mottled leaf of citrus trees, I commenced making a careful microscopic examination of the leaves, branches, bark, wood and finally the soil and roots of diseased trees. My examination was largely confined to trees badly enough affected with mottled leaf as to interfere with the proper ripening of the fruit, making what is called "small offs" in the packing-house. After examining a great many trees on different kinds of soil, I noticed that there was one condition common to all trees badly affected with mottled leaf: an imperfect condition in the fibrous root system, sometimes amounting to a great scarcity of fibrous roots which were broken down, scarred and in various stages of decay. At first I found, under the microscope, only parts of the nematodes, a head here and a tail there, but later, by scraping the rootlets while submerged in water, I found live, actively moving specimens, in many cases very numerous on badly decayed roots. I have obtained as many as fifty specimens from four

pieces of fibrous roots, the size and length of a common pin. It seemed to me that if this condition existed throughout the fibrous root system it would be sufficient burden on the tree to cause yellowing of the leaf irrespective of other influences that might be at work on the tree.

I reported the matter to Mr. Meserve, and later to Mr. William Wood, the present horticultural commissioner of Los Angeles County, who encouraged me to go on with the work. I have at various times reported the work to professional horticulturists, from whom very little encouragement has been received, until Mr. E. E. Thomas[1], of the Whittier Laboratory, followed up the matter and published a circular on the subject. I wish to thank Mr. Thomas for his interest in the matter, notwithstanding the fact that the problem will be worth very little to me, but might be worth something to him.

I believe that nematodes often infest the roots of nursery stock that are transplanted in the orchard and that they spread from one tree to another in the irrigation and storm water. I have kept these nematode worms for eight days in water without apparent injury. In badly infested orchards they appear to infest the roots of the vetch, malva and other weeds, sometimes to the extent of killing out the vetch and malva. They apparently make little headway on the alfilaria.

I have had some success in treating affected trees with carbon bisulphide. The best results were obtained by making shallow holes about two inches deep, one foot apart each way, and putting about three fourths of an ounce of carbon bisulphide in each hole and covering the ground with an impervious tent or cloth and allowing it to remain for about forty-eight hours before removal. After treating the ground with this dosage no live nematodes could be found. Just how much smaller dosage could be used with success I do not know. Trees treated with greater amounts than this showed injury and lost their leaves. After treating, the ground was covered with a mulch of barnyard manure, about one inch thick, which kept up an even moisture content of about ten per cent during the season following. The trees now show a normal condition of fibrous roots, but are not entirely free from the nematode. The pest, however, is so far eliminated that the trees are doing well.

I think that mottled leaf and the "small off" is due to the large numbers of the pest that infests the roots. Just as with other pests, as for example the red spider, a small number will do no apparent injury, while a large increase in numbers will cut down the productiveness of the tree to a great extent.

[1]A preliminary report of a nematode observed on citrus roots and its possible relation with the mottled appearance of citrus trees.—Circular 85, Cal. Agrcl. Exp. Station, Feb., 1913.

THE USE OF FLOUR PASTE IN LIME-SULPHUR SOLUTIONS IN THE CONTROL OF THE CITRUS RED SPIDER.

By J. D. Neüls, Expert, U. S. Dept. of Agriculture, El Centro, Cal.

At the writer's suggestion, a few tests, using commercial lime-sulphur with the addition of flour paste made according to the directions in Circular No. 166 of the Bureau of Entomology by Mr. W. B. Parker, were made by Mr. Sweigert, the inspector at Whittier, against the citrus red spider (*Tetranychus mytilaspidis*). In all the plots treated, a few trees were sprayed with lime-sulphur solution without the flour paste added, as a check. Although the experiments were few and owing to the departure of the writer to other fields, were not carried through to the desired completion, the results were so satisfactory that the writer was requested by Mr. Essig to publish a brief account of the results.

No difficulty was encountered in picking out the trees that were sprayed with the lime-sulphur alone. The spotting of the leaves and fruit, familiar to all who have had occasion to use the lime-sulphur solution, was not to be found on the trees where the flour paste had been added. So even was the distribution that only by a close examination could one tell that the tree had been treated. Conversation with the sprayer brought out the fact that hereafter, even if the grower refused to sanction the small additional expense of the flour paste, the sprayer would add it himself because the pumps worked much better. There was no clogging either in the pumps or at the nozzle and a two hundred gallon tank of the spray with the flour paste added would cover more trees than with the lime-sulphur alone.

The chief objection to the lime-sulphur solution has been that it spotted the fruit, particularly oranges, necessitating washing. These experiments point to the fact that with the additional flour paste the washing of the fruit may not be necessary. The distribution of the lime-sulphur is so even when the flour paste is added that it spreads over the surface of the leaves and fruit in a thin film so that very little spotting occurs. The few spots that do occur and which are generally formed where the solution drops off the leaves or fruit, are of such a character (because of the flour paste) that they dry and crack, so that if they do not fall off of their own accord in the field they are very easily brushed or rubbed off in picking. It was the intention of the writer to follow up the fruit that had been sprayed with the lime-sulphur and flour paste to the packing-house to see whether or not it had to be washed, but circumstances prevented.

The effectiveness of the commercial lime-sulphur solution with the flour paste added in the right proportion is increased owing solely to the fact that the distribution is much greater. The insecticidal value of the lime-sulphur solution against red spiders is the best known of any remedy and the addition of the flour paste seems to bring this solution to the highest point of efficiency.

The purpose of this article is to bring these points and suggestions before the minds of those interested in the control of the citrus red spider with the hope that it may stimulate others to experiment along this line and thus develop a thorough and efficient method in controlling this serious pest.

FISKE AND THE GYPSY MOTH.

By HARRY S. SMITH, Superintendent State Insectary, Sacramento, Cal.

The Federal Bureau of Entomology has recently issued a circular, No. 164, entitled "The Gypsy Moth as a Forest Insect, With Suggestions as to Its Control." This article by W. F. Fiske, the foremost authority on natural control of insects, will cause all lovers of trees, especially those in New England, to breathe a bit easier. The gypsy moth is no longer the dreaded pest of 1896 to 1900. While it is still a vital factor in American forestry, wholesale devastation, not only of all forest trees, but of fruit and shade trees and even gardens and fields, is a condition which no longer prevails. The situation with regard to this insect has become greatly improved within recent years.

This improvement of conditions is said to be due to four main causes: (1) The perfection and standardization of the methods of artificial repression; (2) the death of a large proportion of the more susceptible trees or their removal from the infested woodlands; (3) the importation of parasitic and predatory insect enemies; and (4) the development of the "wilt" disease.

California parasite enthusiasts have watched with considerable interest the attempt to introduce the natural enemies of the gypsy moth into New England. They will then be much interested in what Mr. Fiske has to say with regard to the progress of this work. He writes as follows:

"There are about thirty species of insect enemies of the gypsy moth which appear to be of importance in checking its increase in Europe and Japan. All of the promising species have been imported and colonized under more or less satisfactory conditions in America. Not all have successfully accommodated themselves to their new environment. About one third of the total appear to have done so and to be steadily increasing in efficiency in accordance with their powers of multiplication and dispersion.

"It was hoped that more of them would acclimatize themselves; it was feared that the number might be less. On the whole, the results are decidedly satisfying, and the State of Massachusetts and the United States Department of Agriculture have no cause to regret having undertaken the unexpectedly formidable task of parasite importation. Within a territory centering a little to the northward of Boston, it may be conservatively stated that fully fifty per cent of the eggs, caterpillars, or pupæ of the gypsy moth, in the aggregate, were destroyed by imported parasites in 1912."

Owing to the great expense attached to the use of artificial means of control, such as spraying, these methods are available only on shade trees and in parks. In the infested New England forests the bacterial or "wilt" disease and the insect enemies constitute the factors upon which the authorities mainly rely for repression. Of these Mr. Fiske states that—"More than to the parasites, more than to the perfection of the methods of artificial suppression, the amelioration in conditions is due to the 'wilt' disease." This malady is of bacterial origin and is apparently similar to the flacherie of the silkworm. It first appeared in New England in 1903 or 1904. By 1911 it reached its climax and

was everywhere in evidence. A peculiar fact noted by Mr. Fiske, with regard to this disease, is that strangely enough its virulence is greatly augmented when the caterpillars feed upon certain species of trees and shrubs, and for that reason these trees are practically resistant to the gypsy moth attack. The great importance attached to this discovery is obvious.

Mr. Fiske has spent a large part of the past four years abroad in the study of the gypsy moth, paying especial attention to its control through natural factors. He also investigated carefully the effect upon the moth's abundance of certain types of forests and forest management. His study in Europe, added to by extensive experiments carried on in this country under the direction of A. F. Burgess of the United States Department of Agriculture and Doctor Wheeler of Harvard, has thrown great light upon the subject of resistance of various types of forests to the moth through the agency of the "wilt."

In brief it has been found that upon certain trees, principally the oaks and birches, the moth increases rapidly to the point of complete defoliation. Upon certain other trees, when growing alone, it rarely increases to the point of defoliation, and usually is barely able to hold its own. This latter group includes the conifers, some poplars, chestnut, hickory, sycamore, elm, catalpa, ash, locust, maple and several others. These trees are spoken of as being resistant to the gypsy moth through the operations of the "wilt" disease.

With regard to the practical application of this valuable information, Mr. Fiske has the following to say:

"There are, therefore, two phases of the complex problem of gypsy moth control in forests which must be considered. First, how best to eliminate the oak and secure its replacement by other, and, if possible, more valuable trees; and, second, how best to protect the oak from serious injury in localities where little else can be grown to advantage.

"In a large portion of the area at present infested by the gypsy moth the solution is almost absurdly simple. This is the natural home of the white pine, one of the most valuable timber trees to be found in the whole temperate zone. In a way the oak is an interloper. Over a large part of New England the white pine was once preeminent, and it would become so again were the country to be deserted by civilized man. The pine reproduces freely, if given half a chance, but there are thousands of acres in the aggregate in which a natural reproduction of pine is being retarded, destroyed even, through the mere circumstance that the oak chanced to secure a running start, by sprouting when the land was last cut over. The German forester who would permit such conditions to prevail would be considered hopelessly, even criminally, insane. Under such circumstances oak is to be considered as a weed, and the advent of the gypsy moth as a blessing when, as sometimes happens, it takes the oak and leaves the pine. If it would always do just that and nothing more its progress might be watched with a certain degree of complacency. But it does not always stop at that, and, what is worse, injudicious cutting not infrequently results in greater damage than would be done by the gypsy moth itself. The larger pines are apt to be cut or broken down, and the smaller ones, unable to compete with the rapidly growing oak sprouts, are quickly in no better condition than before.

"The natural program, therefore, in every pine and oak mixture, is so to eliminate the oak as to afford the pine a better opportunity to take possession of the ground. How this may best be accomplished depends entirely upon the individual characteristics of any particular wood lot. And, furthermore, it is strictly a problem in applied forestry and one for the forester, not for the entomologist, to solve."

To those who have witnessed the devastation of the New England forests through the gypsy moth during the past twelve years, Mr. Fiske's message will be most welcome. While in the light of the work done the remedy seems simple enough, the idea is a big one, really the result of genius, and the Bureau of Entomology is to be congratulated on having placed so able a man as Fiske on this important work.

TEAR STAINING OF LEMONS.

(Due to the fungus *Colletotrichum glœosporioides* Penz.)

By H. S. Fawcett, Plant Pathologist, State Commission of Horticulture, Whittier, California.

A faint, reddish stain has often been noticed on lemons, as if formed in a drop of dew, or as if a drop of water had run down over the surface of the fruit, leaving infection in its track. It sometimes covers a large part of the fruit. Usually this stain only slightly injures the appearance of the fruit, but since it is set in the surface of the rind and cannot be washed off it is sometimes troublesome.

This faint staining of the surface is not to be confused with "red rot" (see Fig. 57, Bul. 218, California Experiment Station), in which a large area on one side is highly colored and somewhat hard and shrunken, nor with "red spot," a reddish pitting in which small red sunken pits are formed. (See description and Fig. 18 by E. O. Essig, in Pomona College Journal of Economic Botany, Vol. I, page 33, and see also illustration in California Plant Diseases, Bul. 218, Fig. 55, California Experiment Station.) Considerable doubt has existed as to whether the faint, reddish discoloration on lemons in California, known as tear stain, was due to the same cause as the tear stain of Florida fruits attributed by P. H. Rolfs to the wither tip fungus *Colletotrichum glœosporioides.*

Some recent experiments by the writer indicate that it is the same. The results of the experiments are also confirmed in an unpublished manuscript report by C. N. Jensen in 1910 at the Whittier Laboratory, that a reddish stain of this kind can be produced on uninjured lemons in California with spores of this fungus. Lisbon lemons of various ages were picked and placed at once into a glass jar on March 14, 1913. The spores from a culture of wither tip fungus isolated from a lemon tree at Santa Paula were shaken up in water and poured over these fruits. The jar was then covered to keep the fruit moist. In two weeks the faint reddish stains in blotches and in lines where the water with spores had run down were quite prominent. In four weeks they were still more pronounced. They appeared to develop on green, half-grown fruit, as well as on mature fruit. Other fruits picked at the same time and kept in a moist jar without the application of the

spores failed to develop these stains. A microscopic examination of the stained areas showed the characteristic appressoria or contact pads of the wither tip fungus. These seemed to be confined almost entirely to the stained areas. The stain appeared to be due to cells that had been discolored by the presence of the fungus. In some cases hyphæ could be made out under the microscope, apparently just partly imbedded in the surface cells and so connected with these contact pads as to belong evidently to the same fungus. Some lemons in a second jar were very minutely punctured over small areas with a needle on which numerous spores of wither tip fungus were clinging. In two weeks a slightly sunken area with broken-down cells and a reddish stain was evident. Other fruits punctured in the same way without spores being present on the needle showed a slightly sunken area with nearly as many broken down cells as in the others, but the red stain was absent. These experiments seem to prove that the wither tip fungus is at least one of the causes for tear staining of lemons in California and may cause reddening of slightly injured places.

As the spores of this fungus are common in dead twigs or limbs that have died from any cause, it is important to keep these cut out as much as possible. The drip from dews or rains is thought to be the principal cause for the tear staining. It may be mentioned here that there is sometimes a faint staining of the fruit merely due to dirt and dust washing down over the fruit and which can be rubbed off easily. This is not normal "tear staining."

Tear staining may also be prevented by spraying with a good fungicide. Lime-sulphur solution, Bordeaux mixture, or ammoniacal solution of copper carbonate may be used. The disadvantage of Bordeaux mixture is that when followed within a few weeks or months by fumigation for insects, it is apt to cause defoliation. Lime-sulphur solution is suggested as the best when all things are considered, since it is also useful in controlling the red spider.

GENERAL NOTES.

ROOT-KNOT.

We are getting specimens of root-knot from many vegetables, shrubs and trees. As is well known this is a nematoid affection, being produced by the nematoid worm, *Heterodera radicicola*. It attacks very many weeds as well as our cultivated plants. It attacks potatoes in several counties of the State. In receiving nursery stock or ornamental plants from outside the State or in intercounty shipments, we should refuse any specimens that show this disease. Rotation of crops has special significance in view of this affection. We are studying to know what plants are immune, if such there be, to know what to plant in infected soil. In the case of this malady, as with the bacterial affection, known as crown gall, trees or shrubs badly diseased may well be uprooted and destroyed. I doubt if any plant ailment in our State is more common than this root-knot.—A. J. Cook.

LIME-SULPHUR.

There are two reasons why we regard this solution with exceptional interest. I believe it originated in California, and it is a very excellent specific against many pests—insect and fungoid. We may often use it at a time when it will work the destruction of two or more serious enemies to our fruit trees and shrubs. The terrible pernicious scale, *Aspidiotus perniciosus*, yields to this solution, as to no other known remedy. In this case it is used as a winter spray and does no harm to the defoliated trees. Sulphur alone is often a sure preventive of the work of the mites usually called spiders, as the red spider. Many fungi yield to the lime-sulphur solution, as curl leaf in the peach and the various mildews. Thus lime-sulphur solution is both a fungicide and an insecticide. It is comparable to Bordeaux, and these two are the sovereign remedies for fungoid diseases.

One of the most common and most destructive pests known to the gardener and fruit grower is the mite, or "spider," of which there are several species, as the pear blister mite which deforms and injures pear foliage and blisters the pear itself. This and the related silver mite are very minute. It is more than probable that a close study would determine that both of these affections could be controlled by the use of the lime-sulphur solution. In all cases of blights, a trial should be made first of lime-sulphur, as the cheaper, and then of the Bordeaux.

Sulphur alone dusted on the foliage is often a very satisfactory specific against mildews and mites. Here the heat of the sun produces fumes from the powdered sulphur. In cool or cloudy weather these fumes are often not enough in evidence to produce results, in which case the lime-sulphur solution may be very effective.—A. J. Cook.

SULPHURING FOR MILDEW.

Some roses are especially susceptible to mildew attack. As in the case of the grape, powdered sulphur if applied in season will usually prevent this blighting mildew from injuring the shrubs. These mildews are always more severe in times of fogs and a damp atmosphere. The crimson rambler and Marie Henriette roses are especially liable to attack. To work a sure cure, the sulphuring must be done early before the mildew attacks the plants. However, it will do good later as the new foliage that starts after the diseased leaves fall will be saved from affection. The spores, seeds of the fungus—if we may so speak—are killed by the sulphur, while the fungus if started is immune.

In advising, I have usually suggested that the first sulphuring should be done at the same time that the winter cover crop is to be plowed under in February. Thus, the house wife as she applies the sulphur to her scarlet rambler will remind the "Gude Man" of the house that it is time to turn under his vetch, or *vice versa*.—A. J. Cook.

PEAR-LEAF BLISTER-MITE ATTACKING FRUIT.

The pear-leaf blister-mite, *Eriophyes pyri* Pgst., is quite abundant in the central and northern parts of the State and its work upon the leaves is familiar to all. It is not, however, generally known that this mite also attacks the fruit. Considerable damage is being done to the young pears this year. Mr. J. E. Hassler, county horticultural commissioner of El Dorado County, sent in the first affected fruit with the statement that much of the young fruit was affected. Later specimens were sent in by Commissioner D. F. Norton of Nevada County.

Fig. 333.—Work of the pear-leaf blister-mite, *Eriophyes pyri* Pgst., on fruit. (Original.)

The work upon the fruit greatly resembles that upon the leaves. There appear small chafed areas which enlarge and later appear as distinct rings with reddish or dark border and lighter sunken center.

In badly infested cases the rings merge into one another, forming a very scabby-looking blotch. The illustration shows this clearly, but does not show the rings, because of the lack of contrast between the light-red and rose-tinted fruit.

Mr. Hassler informs the writer that the mite is very difficult to control on the fruit and after two years' experience believes that a lime spray composed of from twelve to fourteen pounds of lime to forty gallons of water is superior to a lime-sulphur spray.

In treating the mite during the winter he has found the addition of lime to the commercial lime-sulphur solution decidedly helpful.—E. O. Essig.

UNIVERSITY OF CALIFORNIA JOURNAL OF AGRICULTURE.

We are very glad to announce the appearance of the above publication which is certainly a credit to those who are behind it. The first issue, Vol. I, No. 1, appeared this month and contains the following leading articles:

Selective Immigration.....Dean Hunt
Soil Surveys in California.....Prof. C. F. Shaw
What the Agricultural Experiment Station Hog Serum Laboratory is Doing for California Hog Raisers.....Prof. C. M. Haring
Frost Fighting on the Limoneira Ranch.....Carl Nichols
The Spirit of Co-operation.....Wm. McNaught
The Cotton Outlook in Imperial Valley.....W. E. Packard

It is pushed by the students in the College of Agriculture under the editorship of Mr. H. H. Warner.—Editor.

MONTHLY CROP REPORT—MAY.

These data are compiled by the secretary from monthly crop reports made by the county horticultural commissioners. Counties not included have not reported or the reports have come too late for press. Unless otherwise designated percentages refer to last year's crop.

Alfalfa.

Colusa—120 per cent of last year's crop of 200,000 tons. *Glenn*—Average of 1½ tons per acre where irrigated. *Inyo*—Full crop of 110,000 tons. *Kern*—Normal crop of 25,000 tons. *Lake*—Normal. *Los Angeles*—Full crop of 113,062 tons; a somewhat cold spring has shortened the alfalfa season, but increased acreage will bring up the total crop. *Madera*—125 per cent of last year's crop, 18,250 acres. *Mendocino*—Full crop. *Monterey*—25 per cent more than last year. *Nevada*—Full crop. *Orange*—Full crop. *Sacramento*—90 per cent of last year's. *San Benito*—Normal. *San Diego*—Crop at least 10 per cent better than last year's. *Siskiyou*—Excellent crop; 30 per cent more planted than last year. *Solano*—10 per cent more than last year's crop, there being plenty of water in the alfalfa regions. *Sonoma*—90 per cent of last year's crop of 3,500,000 pounds. *Stanislaus*—10 per cent more than crop of last year; 120,000 acres in bearing; first cutting one ton to acre. *Tehama*—Full crop. *Tulare*—75 per cent of normal crop. *Yolo*—10 per cent increase over last year's. *Yuba*—Full crop of 7,500 tons.

Crop to be much larger than that of last year.

Almonds.

Alameda—Crop in fine condition, promises to exceed last season's crop by 50 per cent. *Butte*—25 per cent of crop. *Contra Costa*—25 per cent of last year's crop of 250 tons; due to frost. *Glenn*—75 per cent. *Lake*—10 per cent. *Los Angeles*—75 per cent of last year's crop of 57,770 pounds. *Madera*—100 per cent. *Nevada*—Only 10 per cent of last year's crop of 12,000 pounds; early bloom was killed by frost. *Placer*—25 per cent. *Riverside*—90 per cent. *Sacramento*—One third of full crop. *San Benito*—100 per cent. *San Bernardino*—Caught by frost, no crop. *San Joaquin*—Almost failure. *Solano*—65 per cent of last year's crop. *Sonoma*—Same as last year's crop. *Stanislaus*—5 per cent of last year's crop of 240,000 pounds. *Sutter*—Half crop. *Tehama*—25 per cent of last year's crop of 200,000 pounds. *Ventura*—75 per cent of last year's crop; only small acreage in almonds. *Yolo*—Nonpariel and Drake's seedling 95 per cent of last year's crop. Texas prolific, Ne Plus Ultra, IXL 30 per cent.

Almonds will be very short this year but are looking better than at time of last report.

Apples.

Butte—80 per cent. *El Dorado*—40 per cent. *Fresno*—80,000 pounds. *Glenn*—75 per cent. *Inyo*—75 per cent of last year's crop of 1,250,000 pounds. *Kern*—100 per cent. *Lake*—25 per cent of last year's crop which was 50 per cent above normal. *Los Angeles*—6,221,250 pounds. *Mendocino*—50 per cent. *Nevada*—40 per cent of last year's crop of 7,000,000 pounds. *Monterey*—40 per cent to 50 per cent. *Orange*—115 per cent. *Placer*—Fair crop, little early for estimate. *Riverside*—85 per cent. *Sacramento*—75 per cent. *San Benito*—50 per cent. *San Bernardino*—95 per cent. *San Diego*—85 per cent. *San Joaquin*—Good crop. *Santa Barbara*—7,521,325 pounds. *Santa Clara*—70 per cent. *Santa Cruz*—1,000 to 1,500 carloads for valley; perhaps 2,000 carloads for county. *Siskiyou*—Fair crop. *Sonoma*—75 per cent of last year's crop of 13,500,000 pounds. *Stanislaus*—75 per cent of last year's crop of 112,500 pounds. *Tehama*—24,000 pounds. *Tulare*—65 per cent. *Yuba*—80 per cent of last year's crop of 100 tons.

Though not normal a fair crop is assured.

Apricots.

Alameda—50 per cent. *Butte*—30 per cent. *Contra Costa*—60 per cent. *Fresno*—25 per cent of last year's crop of 50,000 pounds. *Glenn*—50 per cent. *Inyo*—Normal. *Kern*—80 per cent. *Kings*—35 per cent. *Lake*—25 per cent. *Los Angeles*—90 per cent of last year's crop of 7,250,000 pounds. *Madera*—25 per cent. *Monterey*—200 per cent. *Nevada*—15 per cent of last year's crop of 10,000 pounds. *Orange*—Crop is 50 per cent of last year's, but only 25 per cent of normal. *Placer*—60 per cent. *Riverside*—100 per cent. *Sacramento*—75 per cent. *San Benito*—65 per cent. *San Bernardino*—80 per cent. *San Joaquin*—With few exceptions a failure. *Santa Barbara*—1,495,921 pounds. *Santa Clara*—50 per cent. *Santa Cruz*—100 per cent. *Solano*—100 per cent. *Sonoma*—500,000 pounds. *Stanislaus*—10 per cent of last year's crop of 100,000 pounds. *Sutter*—100 per cent. *Tehama*—50 per cent of last year's crop of 1,000,000 pounds. *Tulare*—20 per cent. *Ventura*—10 per cent of last year's crop of 2,400 tons dried. *Yolo*—40 per cent. *Yuba*—80 per cent of last year's crop of 20 tons.

The apricot crop will be short, varying from one half to three fourths of last year's crop.

Beans.

Los Angeles—90 per cent of last year's crop of 5,775,000 pounds. *Monterey*—100 per cent. *Sacramento*—18,000,000 pounds. *Siskiyou*—Fair crop. *Sonoma*—256,000 pounds. *Stanislaus*—50 per cent of last year's crop of 720,000 pounds. *Ventura*—65,000,000 pounds, more limas planted than ever before.

A good crop of beans is expected throughout the State.

Berries.

Glenn—Full crop. *Kern*—100 per cent. *Kings*—Normal crop. *Los Angeles*—100 per cent. *Mendocino*—50 per cent. *Monterey*—70 per cent. *Nevada*—50,000 pounds. *Orange*—100 per cent. *Sacramento*—100 per cent. *Santa Clara*—Good. *Santa Cruz*—Over normal. *Siskiyou*—100 per cent. *Sonoma*—95 per cent of last year's crop of 1,000,000 pounds which was unusually large. *Stanislaus*—100,000 pounds.

Berries will make a good crop throughout the State.

Cherries.

Alameda—45 per cent. *Butte*—100 per cent. *Contra Costa*—70 per cent. *El Dorado*—40 per cent. *Glenn*—80 per cent. *Kings*—100 per cent. *Los Angeles*—100 per cent. *Mendocino*—50 per cent. *Monterey*—50 per cent. *Nevada*—30 per cent. *Placer*—70 per cent. *Riverside*—85 per cent of full crop. *Sacramento*—100 per cent. *San Benito*—50 per cent. *San Bernardino*—80 per cent of full crop. *San Joaquin*—25 per cent. *Santa Barbara*—102 per cent. *Siskiyou*—100 per cent. *Santa Clara*—50 per cent. *Santa Cruz*—100 per cent. *Solano*—80 per cent. *Sonoma*—65 per cent of last year's crop of 3,000,000 pounds, which was unusually large. *Stanislaus*—14,000 pounds. *Sutter*—75 per cent.

Harvesting has commenced in the valleys, and though the crop is short, prices are making up for a normal year.

Figs.

Butte—100 per cent. *Fresno*—100,000,000 pounds. *Glenn*—50 per cent. *Los Angeles*—97,376 pounds. *Madera*—Looks like 100 per cent. *Nevada*—75 per cent of last year's crop of 68,000 pounds. *Sacramento*—100 per cent. *Solano*—100 per cent. *Stanislaus*—80,000 pounds. *Tulare*—75 per cent. *Yolo*—100 per cent. *Yuba*—10 tons dried.

A big crop is apparently assured throughout the State.

Grapes (Wine).

Contra Costa—50 per cent. *El Dorado*—70 per cent. *Fresno*—180,000,000 pounds. *Kern*—100 per cent. *Kings*—Crop will probably be affected by dry weather; estimate too early. *Lake* 100 per cent. *Madera*—100 per cent. *Mendocino*—50 per cent. *Nevada*—3,000,000 pounds. *Placer*—Good crop. *Riverside*—100 per cent. *Sacramento*—100 per cent. *San Bernardino*—95 per cent of full crop. *Shasta*—Fair. *Solano*—Too early for estimate. *Sonoma*—65,000,000 pounds. *Stanislaus*—4,000,000 pounds. *Sutter*—Too early for estimate. *Tehama*—1,600,000 pounds. *Tulare*—Outlook good, but too early for estimate. *Yolo*—Good bloom. *Yuba*—400 tons.

There are prospects for a good crop of wine grapes, though it is yet a little early to make a definite estimate.

Grapes (Table).

Contra Costa—65 per cent. *Fresno*—Equal to last year's crop of 10,000,000 pounds. *Glenn*—100 per cent. *Inyo*—Crop of 350,000 pounds. *Kern*—100 per cent. *Los Angeles*—Equal to last year's crop of 33,634,730 pounds. *Madera*—Looks like full crop, little early. *Mendocino*—50 per cent. *Monterey*—Looks good. *Nevada*—Equal to last year's crop of 1,500,000 pounds. *Placer*—Better than was expected. *Sacramento*—100 per cent. *San Bernardino*—95 per cent of full crop. *San Joaquin*—Appearances indicate fine crop; contracts being let for $25 a ton. *Shasta*—Looks good. *Siskiyou*—Excellent crop. *Solano*—90 per cent. *Sonoma*—Full crop of 500,000 pounds. *Stanislaus*—Equal to last year's crop of 3,000,000 pounds. *Sutter*—Heavy bloom. *Yolo*—Good prospects. *Yuba*—Crop of 200 tons.

Good crop expected throughout the State.

Hops.

Lake—100 per cent. *Mendocino*—Too early for estimate. *Sacramento*—100 per cent. *Sonoma*—Equal to last year's crop of 4,500,000 pounds. *Yuba*—Crop of 700 tons baled.

A little early for reliable estimates, but prospects are good.

Lemons.

Glenn—Full crop set. *Los Angeles*—10 per cent of last year's crop of 59,151,284 pounds, due to January frost. *Nevada*—Crop a failure, due to frost; only a few boxes. *Orange*—50 per cent, due to frost. *Riverside*—50 per cent of crop. *Sacramento*—100 per cent. *San Bernardino*—40 per cent of full crop, due to frost. *San Diego*—15 per cent, due to frost. *Santa Barbara*—98 per cent of last year's crop of 3,146,850 pounds. *Stanislaus*—Just in bloom. *Tehama*—Equal to last year's crop of 20,000 pounds. *Tulare*—Too early for estimate. *Ventura*—Normal crop of 565 cars.

Very small output is expected.

Olives.

Fresno—Equal to last year's crop of 15,000,000 pounds. *Glenn*—Now in full bloom. *Los Angeles*—Crop estimated to be double last year's crop of 387,500 pounds. *Madera*—Good prospects. *Nevada*—Too early for estimate. *Placer*—60 per cent. *Riverside*—100 per cent. *Sacramento*—100 per cent. *San Bernardino*—90 per cent. *Santa Barbara*—Crop of 623,136 pounds. *Sonoma*—Equal to last year's crop of 650,000 pounds. *Stanislaus*—Too early. *Tehama*—Crop estimated at 1,000,000 pounds. *Tulare*—85 per cent..

A good crop of olives is promised.

Oranges.

Colusa—Good setting. *Fresno*—Equal to last year's crop of 5,000,000 pounds. *Glenn*—100 per cent. *Kern*—Good. *Los Angeles*—50 per cent more than last year's crop of 44,550,000 pounds. *Nevada*—400 boxes. *Orange*—90 per cent. *Placer*—70 per cent, small acreage. *Riverside*—60 per cent. *Sacramento*—100 per cent. *San*

Bernardino—60 per cent. *San Diego*—40 per cent. *Santa Barbara*—100 per cent. *Sonoma*—50 per cent. *Tehama*—150,000 pounds. *Tulare*—Too early for estimate. *Ventura*—430 cars.

The crop south will be unusually short because of frost. It will be better in the north.

Peaches.

Alameda—65 per cent. Curl leaf bad. *Butte*—Good. *Contra Costa*—65 per cent. *El Dorado*—50 per cent of full crop. *Fresno*—70 per cent of last year's crop of 30,000,000 pounds. *Glenn*—80 per cent. *Kern*—85 per cent. *Kings*—Normal. *Lake*—25 per cent. *Los Angeles*—10,321,575 pounds. *Madera*—95 per cent. *Mendocino*—25 per cent. *Monterey*—100 per cent. *Nevada*—60 per cent. *Orange*—200 per cent. *Placer*—70 per cent. *Riverside*—100 per cent. *Sacramento*—100 per cent. *San Benito*—75 per cent. *San Bernardino*—90 per cent. *San Diego*—100 per cent. *San Joaquin*—Muirs set well, Albertas about 75 per cent. *Santa Clara*—40 per cent. *Shasta*—Upland crop variable but not full; lowlands nothing. *Sonoma*—55 per cent. *Stanislaus*—35 per cent of last year's crop of 7,500,000 pounds. *Sutter*—Clings 100 per cent, Muirs 75 per cent. *Tehama*—50 per cent of last year's crop of 25,000,000 pounds. *Tulare*—Freestones 60 per cent of normal crop; clings 35 per cent of normal crop. *Yolo*—Prospects for normal crop. *Yuba*—70 per cent of last year's crop of 500 tons.

Peach crop exceedingly variable, but much below that of last year.

Pears.

Alameda—Bartletts have set well and show little scab; other varieties are dropping their fruit somewhat; estimated crop 75 per cent. *Butte*—25 per cent. *Contra Costa*—55 per cent. *El Dorado*—50 per cent of last year's crop. *Glenn*—80 per cent. *Inyo*—Equal to last year's crop of 600,000 pounds. *Kings*—Normal. *Kern*—100 per cent. *Lake*—50 per cent. *Los Angeles*—Equal to last year's crop of 931,150. *Mendocino*—25 per cent. *Monterey*—75 per cent. *Nevada*—40 per cent of last year's crop of 5,760,000 pounds. *Orange*—35 per cent more than last year. *Placer*—90 per cent. *Riverside*—80 per cent *Sacramento*—75 per cent. *San Benito*—75 per cent. *San Bernardino*—Full crop, but few grown. *San Joaquin*—Good. *Santa Clara*—60 per cent. *Shasta*—Light. *Siskiyou*—Good. *Solano*—100 per cent. *Sonoma*—60 per cent of last year's crop, which was unusually large, being 4,500,000 pounds. *Stanislaus*—50 per cent of last year's crop of 260,000 pounds. *Tehama*—10 per cent. *Yolo*—Prospects for good crop. *Yuba*—70 per cent of last year's crop of 1,300 tons.

The pear crop will be considerably less than last year's.

Plums (Shipping).

Butte—90 per cent. *Contra Costa*—100 per cent. *El Dorado*—35 per cent. *Fresno*—10,000 pounds. *Kern*—90 per cent. *Los Angeles*—1,734,700 pounds. *Monterey*—60 per cent. *Nevada*—50 per cent. *Orange*—100 per cent. *Placer*—70 per cent. *Sacramento*—80 per cent. *San Joaquin*—100 per cent. *San Bernardino*—90 per cent; few grown. *Solano*—100 per cent. *Sonoma*—55 per cent. *Stanislaus*—35 per cent of last year's crop of 15,000 pounds. *Sutter*—100 per cent. *Tehama*—10 per cent. *Tulare*—50 per cent. *Yolo*—100 per cent. *Yuba*—60 per cent of last year's crop of 30 tons.

There is a very poor crop of shipping plums this year; much of the young fruit is still dropping.

Potatoes.

Inyo—75 per cent of last year's crop of 10,000 tons. *Kern*—15,000 sacks. *Los Angeles*—16,107,000 pounds. *Nevada*—170,000 pounds. *Orange*—25 per cent, due to decrease in acreage. *Sacramento*—75 per cent, due to dry weather. Late rains may help. *Siskiyou*—100 per cent. *Sonoma*—5,000,000 pounds. *Stanislaus*—10,000,000 pounds.

Present conditions indicate a much smaller crop than that of last year.

Prunes.

Alameda—In irrigated districts crop looks well, dropping elsewhere. *Butte*—90 per cent. *Contra Costa*—65 per cent. *Fresno*—20,000 pounds. *Glenn*—75 per cent. *Kern*—90 per cent. *Lake*—35 per cent. *Los Angeles*—15,000 pounds. *Madera*—100 per cent. *Mendocino*—25 per cent. *Monterey*—60 per cent. *Nevada*—50 per cent of last year's crop of 55,000 pounds. *Orange*—50 per cent better than last year's crop. *Riverside*—85 per cent of full crop. *Sacramento*—75 per cent. *San Benito*—50 per cent. *San Joaquin*—Good setting *Santa Clara*—Between 50,000,000 and 60,000,000 pounds. *Shasta*—Averaging 75 per cent. *Solano*—100 per cent. *Sonoma*—65 per cent of last year's dried crop of 16,500,000 pounds. *Stanislaus*—40 per cent of last year's crop of 8,000 pounds. *Sutter*—75 per cent. *Tehama*—50 per cent of last year's crop of 7,000,000 pounds. *Tulare*—30 per cent. *Yolo*—50 per cent.

The prune crop will be considerably less than that of last year as will be seen under statistics given in general crop conditions at the end.

Walnuts.

Glenn—Good bloom. *Lake*—50 per cent. *Los Angeles*—75 per cent of last year's crop of 6,112,000 pounds. *Nevada*—75 per cent of last year's crop of 13,800 pounds. *Orange*—125 per cent. *Riverside*—80 per cent. *Sacramento*—100 per cent. *San Bernardino*—90 per cent of full crop, orchards still young. *Santa Barbara*—3,146,850 pounds. *Siskiyou*—100 per cent, small acreage. *Sonoma*—100 per cent. *Stanislaus*—5,000 pounds. *Tulare*—65 per cent. *Ventura*—90 per cent of last year's crop of 1,900 tons; still too early for accurate statistics; setting apparently light.

Prospects indicate a good crop of walnuts throughout the State; however, less than that of last year.

GENERAL CROP CONDITIONS.

Prune Crop Situation.

The *Daily Commercial News*, May 20th, reports as follows: The present estimates of the crop at home and abroad in pounds are as follows:

	1912	1913
California	220,000,000	170,000,000
Oregon and Washington	10,000,000	30,000,000
Bosnia-Servia	Nothing	100,000,000
	230,000,000	300,000,000

The California Fruit Grower states that the crop will not exceed 100,000,000 pounds for California and will probably be less.

Cantaloupe Crop in Imperial Valley and Mexico.

There are many conflicting reports relative to the cantaloupe crop in the Imperial Valley and the following is taken from several. The total acreage in California is approximately 6,000 acres; in Mexico 800. It is believed that 3,000 refrigerator cars will be shipped out from California alone at a cash value of $2,335,000. This is the best year the industry has ever known.

The Pacific Northwest.

The Northwestern Fruit Exchange reports the following for May:

Apples.

The damage to apple crops in the Pacific Northwest is almost neglible. Some old trees that bore heavily will have a light crop this year, but the younger orchards will have more, so that the total apple crop promises to be as large as last year. Certain spots in the Yakima Valley lost from 25 per cent to 75 per cent by frost, but it was not general.

Pears.

A few pear orchards in the Rogue River Valley, Oregon, were touched with frost but not seriously.

The *Seattle Post-Intelligencer* gives the following comparative estimate in car loads for the fruit crops for the season of 1913:

	Wenatchee	Yakima
Apples	6,082	2,900
Apricots	137	------
Cherries	47	20
Grapes	-----	50
Peaches	432	1,600
Pears	279	250
Prunes and Plums	42	125

Florida Crop Conditions.

The following estimated conditions on May 1, 1913, with comparisons of the principal crops in Florida, on the basis of 100, representing a normal, is reported by the Crop Reporter of the U. S. Department of Agriculture, May, 1913, as follows:

Crop	May, 1913	May, 1912	May, 1911
Orange trees	90	96	80
Lemon trees	--	90	80
Lime trees	90	90	80
Grapefruit	88	98	60
Peaches	70	85	60
Pears	48	60	50
Strawberries	90	80	80
Watermelons	84	86	80
Cantaloupes	81	84	80
White potatoes	87	84	81
Cabbages	87	80	79
Cowpeas	83	83	85

INSECT NOTES.

Conducted by the editor.

The squash bug, *Anasa tristis* De Geer, is appearing in considerable numbers in the pumpkin fields near Sacramento this month.

The European grain or barley aphis, *Aphis avenæ* Fab., has been especially injurious to the spring crop of barley in Imperial County.

Horticultural Commissioner D. F. Norton of Nevada County, has sent in specimens of a beetle which is cutting off the tender shoots of young pear trees. This insect proves to be *Dascyllus plumbeus* Horn, a lead-colored beetle slightly over one half inch long. This is the first record we have of its being injurious.

A small scarabæid beetle, *Serica anthracina* Lec., has been doing damage to fruit trees in the Sierra foothills this spring. Prune, plum, and apple trees have been entirely defoliated in a few instances and the trees even killed. The beetle also works upon many of the native plants, chief of which is the manzanita. It has been collected in Nevada and El Dorado Counties by a member of the commission. A. R. Baird, Horticultural Commissioner of Inyo County, has also sent it to the office. It was reported as attacking the plum in Riverdale, Fresno County, in "Insect Life," Vol. V, No. 5, p. 350, July, 1893.

The fruit tree pulvinaria, *Pulvinaria amygdali* Ckll., has been found generally distributed in a prune orchard near Woodland, Cal., but not in sufficient numbers to be of economic concern. The leaves, petioles and occasionally the fruit afford lodging places for the egg-laying females. In the same orchard, the prune aphis, *Aphis prunifoliæ* Fitch, was very thick on a few of the tender shoots.

Small tenebrionid beetles are causing much worry among the farmers this year. Commissioner S. A. Pease of San Bernardino County has sent in two speices, *Ulus crassus* Lec., a small brown beetle one fourth of an inch long which was feeding on deciduous fruit trees at Ontario, Cal., and *Eurymetopon bicolor* Horn, a small black species about the same size which he found attacking deciduous fruit trees at Ontario, Cal., and apple trees at Yucaipe, Cal. A. S. Hoyt, deputy state quarantine officer, collected *Blapstinus discolor* Horn, a small black beetle about three sixteenths of an inch long, at Van Nuys, Cal., where it was feeding upon melon and tomato vines. Commissioner K. S. Knowlton has found it necessary to adopt control measures against three beetles, *Eleodes omissa* var. *borealis* Blaisd., *Eleodes armata* Lec., and *Asida lecontei* Horn, all of which are black and about three fourths of an inch long. They are attacking orange trees in Kern County.

The cypress twig-borer, *Phlœosinus punctatus* Lec., is a small brown scolytid beetle scarcely more than one eighth of an inch long, which bores into the cypress twigs usually in the axils of the branches. The twigs often break at these tunnels, thus resulting in severe pruning of hedges. Particular damage has been reported at Napa, Cal., this spring. It was reported from Oceanside, San Diego County, last year.

O. E. Bremner, deputy horticultural commissioner of Sonoma County, has sent in specimens of the yellow currant or gooseberry fruit fly, *Epochra canadensis* Loew. This insect is also quite common in other sections of middle California.

Specimens of the cherry fruit sawfly, *Hoplocampa cookei* Clarke, have been sent in by Mr. J. E. Hassler, county commissioner of El Dorado County, from Placerville, and by D. F. Norton, county commissioner of Nevada County, from Nevada City.

NOTES FROM THE COUNTY COMMISSIONERS.

El Dorado County.

Mr. J. E. Hassler has had remarkable success in controlling the blister mite on pear trees, especially on the fruit, with a lime spray composed of twelve pounds of quicklime to forty gallons of water.

Glenn County.

At a recent meeting of the Board of Supervisors, Mr. James Mills heartily endorsed the work of Carl J. Ley and asked that he be given proper office and field equipment.

Humboldt County.

Mr. Geo. B. Weatherby is planning a series of horticultural meetings in September and has engaged the services of the State Commissioner and Field Deputy to address the meetings.

Kern County.

Mr. K. S. Knowlton reports very serious damage to young orange trees in the county by the tenebrionid beetle, *Eleodes omissa* var. *borealis* Blaisd. He has inaugurated experiments against this insect by spraying with lead arsenate and Paris green.

Los Angeles County.

Mr. William Wood reports remarkable success in the control of the black peach aphis, *Aphis persicæ-niger,* with "Black Leaf 40" spray.

Modoc County.

Mr. O. C. McManus has lately been appointed county horticultural commissioner of Modoc County. He was the only candidate who passed the examination May 1st. He is very actively engaged in his new duties and finds plenty to do.

Riverside County.

Mr. R. P. Cundiff has just completed a very thorough inspection tour of his county.

San Diego County.

The supervisors have wisely provided their county horticultural commissioner with an automobile, which enables him to do an immense amount of practical field work and to keep in close touch with the problems of the growers.

Shasta County.

Mr. George Lamiman is conducting an active campaign against the oak rot fungus, *Armillaria mellea.*

Sonoma County.

Mr. A. R. Gallaway and Mr. O. E. Brenner have conducted a very thorough spraying campaign in their county this spring, which should result in a crop of clean fruit.

Sutter County.

Mr. H. P. Stabler is planning to make extensive exhibits of products raised in his county in a large building recently purchased by the supervisors. According to dispatches he has already established an office and display room in the building and other improvements are being made at his request.

Ventura County.

Upon the findings of Mr. H. S. Fawcett, plant pathologist of the State Commission of Horticulture, Mr. R. S. Vaile is advising his citrus growers to discontinue the use of neat's-foot oil for gummosis and to use Bordeaux paste instead.

Yolo County.

Mr. George H. Hecke has been a recent visitor to the State Commissioner's office. He reports conditions in his county as being very good considering the year.

Yuba County.

Mr. Geo. W. Harney reports that so far this spring he is unable to find any trace of the citrus white fly in Marysville.

QUARANTINE STATISTICS.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, Cal.

With the passing of the month of April ended the first year in which the writer has had charge of the State Horticultural Quarantine service with headquarters at the port of San Francisco. Several changes have been instituted in the methods of conducting the service during that period, and the inspection force has also been increased. For the direction of future policies it was considered necessary to obtain a tabulated form of the results of the work under these new methods. With that end in view a comparative analysis of the statistics covering a period of two consecutive years' work of the force employed has been compiled by Miss E. Clare Dutton, clerk of the division. The findings are such as to make this department feel justified in publishing them, and the same are herewith presented:

Importations of Horticultural Products.

From May 1, 1911, to April 30, 1912.		*From May 1, 1912, to April 30, 1913.*	
Ships inspected	348	Ships inspected	419
Total parcels intercepted	654,107	Total parcels intercepted	701,986
Parcels in baggage of passengers and crew	1,828	Parcels in baggage of passengers and crew	3,399
Express shipments	------	Express shipments	1,971
San Mateo County shipments	15	San Mateo County shipments	167

In an attempt to digest the comparative value of the foregoing it is my opinion that 419 against 348, an increase of 71 ships inspected in a similar period of time, is largely if not entirely a matter of natural fluctuation in trade conditions, and the same may be considered in the case of 701,986 against 654,107, a gain of 47,879 parcels of horticultural products in our favor.

The items worthy of careful consideration, and which are by far the most important in my opinion, are the ones concerned with the parcels of horticultural products intercepted in the baggage of the passengers and crews. This is where the contraband material is usually found, and it was for the purpose of strengthening this branch of the service that I asked for and was granted two additional inspectors. In view of all the publicity that has been given to this matter during this period, as well as the co-operation of the Federal Government, 3,399 against 1,828, a gain of 2,571 parcels in one year from this source is an object lesson which I consider supports my previous judgment of the necessity of augmenting the inspection force.

One of the first things I set in motion after taking charge of this work was a systematic study of all the avenues of entrance into the port of San Francisco that were open to horticultural products, for the purpose of locating leaks in the quarantine service. The items set down in the table as express shipments are proof that such leaks existed. In editing the daily reports of the inspectors I soon noticed the absence of shipments by express, and a search of the books showed that none such had been inspected or recorded for a year previous. It required

both persistent and positive efforts to permanently stop this leak, but it is now one of the most perfectly working phases of the quarantine work, and has yielded up from the express office in the Ferry Building 1,971 parcels of horticultural products that come under our jurisdiction in a space of ten months. Out of this mass of material we intercepted and destroyed 44 lots of fruit fly material, 1 lot of white fly material, and 1 lot of contraband peach trees.

As a result of the enforcement of the provisions of section 1 of the state quarantine law in the matter of arrival of interstate shipments, it became incumbent upon us to attend to this same class of material arriving at points in San Mateo County. This has monopolized a great deal of valuable time, but we have kept up the work and it has yielded good returns.

Enforcing the Federal quarantines on material from European points has brought some interesting developments in our dealings with the parcel post, and the performance of work that should be the duty of a county horticultural commissioner has kept us busy. To all of those who are sufficiently interested in this work to read the foregoing it must be apparent that the quarantine service has not remained stationary. In the opinion of the writer, who believes that the service is still far from being perfect, the progress for the year has been satisfactory.

THE HORTICULTURAL PICKET LINE.

By Frederick Maskew, Chief Deputy State Quarantine Officer and Federal Quarantine Officer, San Francisco, Cal.

When Alexander Craw in November, 1899, at the Port of San Francisco detected the maggots in a shipment of oranges from Acapulco, he established the first outpost of a picket line that now encircles the entire United States. The passing by Congress of the Plant Quarantine Act on August 20, 1912, created the Federal Horticultural Board, and one of the first acts of that body—after a thorough investigation of the men and their methods of inspection—was to enlist the services of the State quarantine officers of California as collaborators of the United

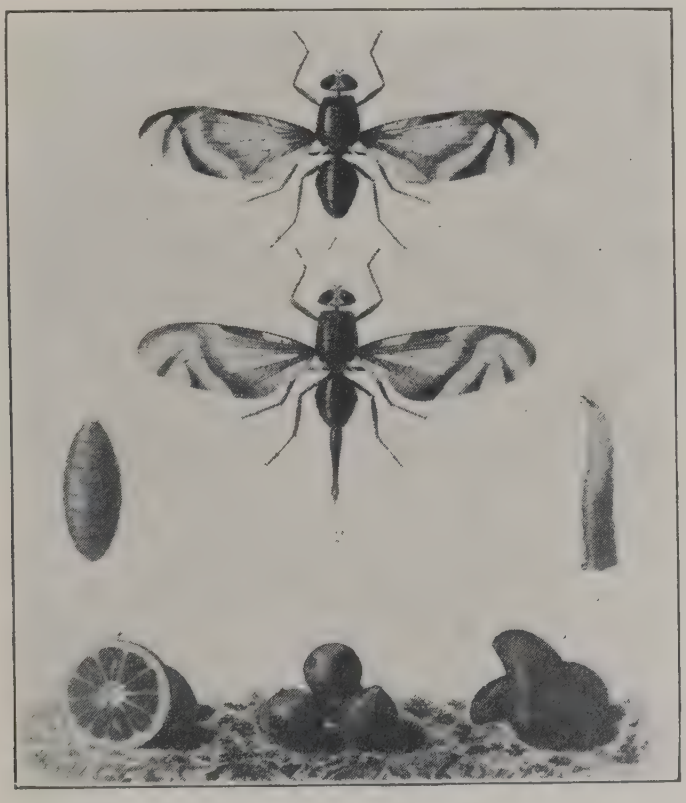

Fig. 334. Various stages of the Mexican orange maggot and some of the common host fruits including oranges, guavas and mangoes. (From Commission de Parasitologia Agricola, Mexico. Photo by Chatterley.)

States Department of Agriculture. Notice of Quarantine No. 5 (foreign) The Mexican fruit fly, was declared on January 15, 1913, and the embargo maintained for twelve years at every port of entry on the coast line of California was at once extended to every port of entry in the United States. Working in conjunction with the Federal Horticultural Board and the State Commissioner of Horticulture, the writer of this article investigated in person the methods employed by the United States Customs officers in putting into execution the provisions of Quarantine No. 5 at every port of entry along the international boundary line from Yuma, Arizona, to Brownsville, Texas.

At Nogales where the Southern Pacific of Mexico enters the United States, I watched the interception of pedestrians crossing the line, and assisted in searching the baggage of passengers who came in by rail. The quarantine on fruit is maintained and its real purpose clearly comprehended by those in authority at this point. At Naco, Collector Randall's duties in this matter are light, the movement of fruit being in the opposite direction, from the United States into the great mining town of Cananea located forty miles away. Records show the only imports of fruit to be Sonora oranges via Lomas and Del Rio en route in bond for foreign points. No local traffic from this point can reach fruit growing or fruit fly districts in Mexico. At Douglas a pernicious practice formerly prevailed. Mexican oranges in carload lots were routed through in bond to Agua Prieta and eventually brought back across the line in small quantities to be distributed in Douglas and adjoining towns in Arizona. Collector Fitzherbert has effectually

FIG. 335. Street car from Mexico at El Paso, Texas, stopped and searched at the international line by federal officers. (Original.)

stopped all such procedures as this, and no Mexican fruit can now pass into the United States at this point. The railroad crossing the international line at Douglas reaches only to Naco Zari, about ninety miles south. No fruit of any kind is grown in the territory tributary to this road. There is no railroad crossing at Columbus in New Mexico; a cattle trail stretches its interminable length into the desert on either side of the national boundary. Here the simple question of distance is a protection that automatically protects, and precludes the possibility of bringing in fruit by any of the methods of transportation available on this route. Nevertheless, the Customs inspector stationed at this port has his orders to confiscate and destroy all fruit that he may encounter.

El Paso is the crux of this quarantine situation on the border. Here arrive trains over the Mexican national lines from all the fruit fly districts in Mexico. Under normal conditions the tourist traffic is large in volume and constitutes the real danger. Curiosity is inherent in each of us, and the all too common antagonism to any attempt to regu-

late personal tastes by enacted laws applies equally to contraband fruit as otherwise. "Uncle" Joe Dwyer, the veteran inspector, courteous, alert, implacable, is master of this traffic situation. By the courtesy of Collector Sharp I was enabled to observe and study all the methods employed in maintaining a quarantine against the Mexican fruit fly at this important port of entry. Using the drastic measures in vogue at San Francisco as a standard of comparison, I came away convinced and satisfied. All passenger trains are stopped, held and boarded at the international line by United States Customs and Immigration officers. All passengers are registered, their belongings searched, and all fruit as well as all other articles of contraband confiscated. The train in charge of the United States officials then proceeds to the Union depot where all trunks and packages are taken into the inspection room, opened and searched.

Going into Mexico via Stanton street, traversing the principal thoroughfares of Juarez and returning into El Paso, street cars run on a fifteen minute schedule. I made the round trip over this route several times before presenting my credentials to the United States Customs officials. In each instance when the returning car reached the United States boundary line it was stopped and boarded by a Customs inspector, an immigration officer and a soldier. In common with all other passengers I was interrogated concerning my purchases made in Mexico, compelled to open and submit their contents to inspec-

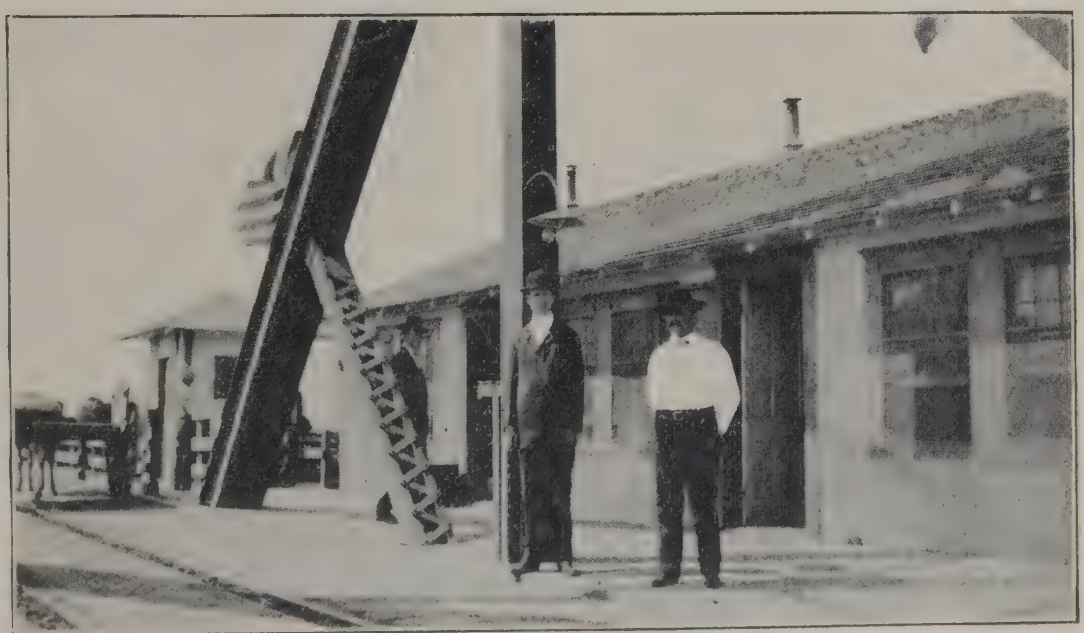

FIG. 336. The international bridge at Brownsville, Texas. Federal officers waiting to inspect passengers and their baggage on a train arriving from Mexican points. (Original.)

tion, and requested to stand up for a closer scrutiny. Later I associated myself with the inspectors stationed on these bridges, witnessed their examination, not alone of the car passengers but of every person coming out of Mexico. No contraband fruit is crossing the dead line here.

Eagle Pass in times of peace is also an important railroad crossing. The difference of opinion at present prevailing along the border as to

which faction shall collect the Customs duties has caused traffic by rail from all Mexican points to cease. Here, as at all other points of entry, orders to all concerned are to confiscate all host fruits of *Trypeta ludens* found attempting to cross the line. I found a copy of these orders together with a list of the fruits quarantined, tacked on the wall of the Customs office located midway on the international bridge. A day spent at this point observing what happens to all of those who are returning with their purchases of carne, verdugas and fruita made in the Municipal market at Porfirio Diaz would satisfy the most captious that this avenue of entrance is closed to the fruit flies.

Laredo is connected by rail with all points in the Republic. Through this port of entry came into the United States the bulk of the commercial shipments of oranges from Mexico prior to the issuance of Notice of Quarantine No. 5. The best criterion that a student can use to judge of the effect of this order in stopping all imports of quarantined fruits from crossing the line or being locally distributed in this

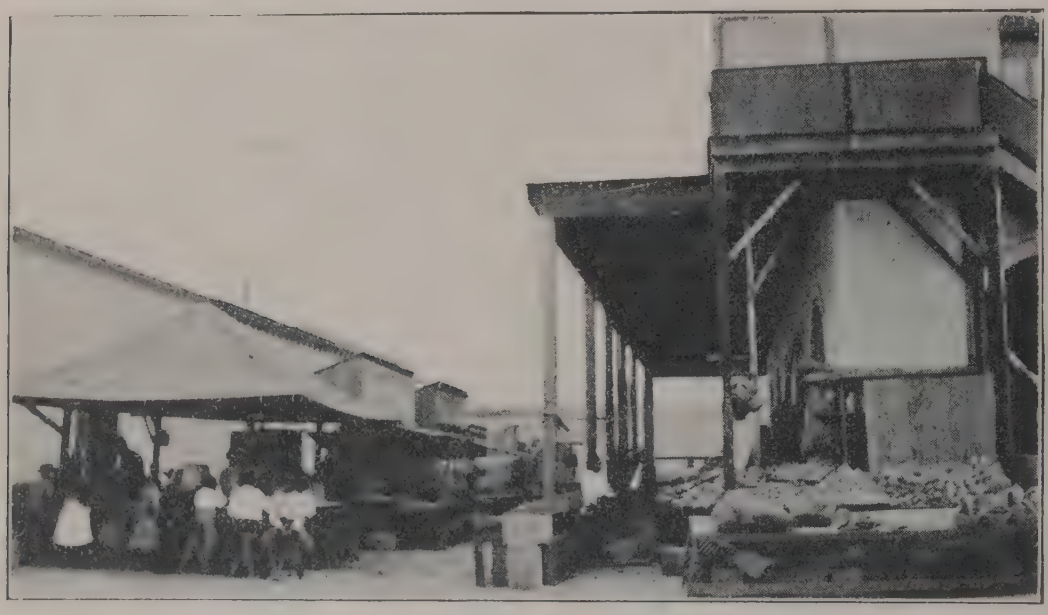

FIG. 337. Fruit in the municipal market at Neuva Laredo, Mexico. (Original.)

vicinity, is the bitter comments of many of those who live or do business in the city of Laredo. The importance also of confiscating the individual specimens of fruit found in the possession of both through and local travelers is fully realized and put into effect by those whose official duty it is to search for contraband articles both on the trains and on the bridge.

At Brownsville an opportunity of demonstrating the positive necessity of this quarantine order presented itself. During my visit a passenger train arrived from the city of Mexico, the first to come through in six weeks. On the international bridge in company with the Immigration officers, the Customs inspectors and Dr. Fairchild of the Public Health service, I boarded this train and took a part in searching the baggage. Among other things we found about twenty-five oranges. Five of these were found in the hand bag of a through passenger in the pullman coach; fine, smooth, thin-skinned fruit, without any external blemish, and encased in wrappers bearing the following legend printed

in colors: "Hacienda Vista Hermosa, El Cercado Nuevo Leon." In the Customs baggage room at the depot in Brownsville I opened these oranges, found the maggotts of the Mexican fruit fly, and before destroying them exhibited the same to the officials whose duty it is to confiscate all such fruit. This was an object lesson of value, the effect of which will be lasting, and the story of this same finding will eventually pass from station to station along the entire length of the border.

There are many minor ports of entry along the border other than those which I have enumerated. At all of these I found in force the same imperative orders to prevent the passing of quarantined fruits. The very nature of the country through which these routes pass is in itself the best possible protection, and in the matter of danger from

FIG. 338. Mexican mangoes taken in the parcels post. (Photo by L. A. Whitney.)

infested fruit found in the Municipal markets of the Mexican border towns, (most of which I visited), the absence of any growing host fruits, in fact, any evidence or possibility of cultivation for many miles contiguous to either side of the line from Yuma to Brownsville precludes the possibility of such fruit flies as emerge from the fruit in these markets finding a local host upon which to perpetuate themselves. The railroad crossings and the through passengers are the true source of possible contamination of our orchards, and all fruit passing through these is now controlled by the United States Customs inspectors.

At the coast ports of entry in California there has always been co-operation between the two services. This grew up as a result of daily association and mutual appreciation of each other's endeavors and interests in their individual duties, and was entirely voluntary. With the advent of the United States Department of Agriculture into this

horticultural quarantine work the co-operation of the United States Treasury Department was promptly obtained and official orders in the nature of Treasury Decisions were sent out broadcast. A "T.D." in the Customs service is the same as a general order to an army; it is imperative, absolute, final; admits of no deviation, and meets with none; means just what it says; applies to every individual in the service, and is carried out to the letter. If a "T.D." prohibits any article from passing a stated point, that is all there is to it; the article in question does not pass. As an illustration of this statement, I have stopped writing this article at this point long enough to inspect a shipment of Mexican mangoes that were turned over to one of my inspectors on this 25th day of June, 1913, by the Customs inspector at the San Francisco post office; a package by registered parcel post from Mexico addressed to Luisa de Antonio, 12 Scott street, San Francisco, in which were found, confiscated and destroyed thirteen mangoes.

For the permanent peace of mind of the fruit growers of California in so far as the Mexican fruit fly is concerned, I herewith reproduce a Treasury Decision that I found in evidence at every port of entry on the boundary line between Mexico and the United States, and what is more to the point, I found the provisions set forth in the same being put into effect:

TREASURY DEPARTMENT, UNITED STATES CUSTOMS SERVICE,
OFFICE OF THE COLLECTOR.

To Customs Inspectors:

"Referred to Notice of Quarantine No. 5, (Foreign), under the Plant Quarantine Act of August 20, 1912, (T.D. 33110), prohibiting the importation from Mexico of certain fruit, the Secretary of Agriculture requests that your attention be called strongly to the desirability of excluding all fruit covered in this Notice of Quarantine.

The Secretary adds that the danger from a small quantity of fruit which may be carried by travelers in their hand baggage is as great, if not greater, than that which might be offered for commercial entry, and that such travelers if en route for California, for example, might easily carry Mexican oranges with them into the citrus districts, and finding them wormy throw them out of the car windows or otherwise dispose of them, thus introducing the Mexican orange maggot into the very heart of our most important citrus district. The Secretary desires, therefore, that you be made fully cognizant of this danger.

For the reasons above set forth, you are enjoined to observe the greatest care to exclude all the fruit in question."

The fruits referred to are Oranges, Sweet Limes, Mangoes, Achras, Sapotes, Grapefruit, Peaches, Guavas, and Plums. (T.D. 33071, 33110, 33247.)"

Try and realize what this means. The rank and file of that great army the United States Customs service, awakened to a true sense of the fact that there are other things more permanently injurious, more deadly and fatal to California's future than opium; that in the final analysis a maggoty mango is more to be dreaded as an ultimate treasury depleter than all the diamond smugglers that ever crossed the border; that the finding and confiscation of fruit fly material is one of the paramount purposes of searching personal baggage and ships' interiors; that a string bean has now as much significance as a string of pearls, and you will begin to obtain a true perspective of the system of protection that has developed mainly as a result of the practical persistent work, the examples and the precepts set and maintained by the horticultural quarantine officers of the State of California.

THE KIND OF FRUIT THAT PAYS.

By Geo. P. Weldon, Chief Deputy Commissioner of Horticulture, Sacramento, Cal.

California is noted for its splendid fruits, and the climate of the State is such that a great diversity of them may be grown. Certain sections are found to be best adapted to the growing of certain fruits, and the prospective orchardist can find practically anything to his liking somewhere within the State.

The kind of fruit that one should grow will depend largely upon what has been tested in the particular locality where he settles and which has proven a success.

It matters not whether peaches, apricots, apples, pears, prunes, oranges, lemons, or cherries are grown, the one rule holds true, that only good fruit will command the best prices. The variety of a particular kind of fruit, whether citrus or deciduous, may mean much but size and quality usually mean much more. Small, scabby, ill-shapen fruit is not desirable, and the man who neglects his orchard to the extent that his fruit will be of low grade must surely take the consequences in the way of poor prices, and often failure, where success should be his.

The statement has often been made that there are more fruit growers than orchardists. California may well boast of her orchardists. As a class I am told they are men who could succeed in almost any other line of business. Many of them are college or university graduates. Up-to-date scientific methods appeal to them, and no efforts are spared to check disease when it appears; to fight insect pests that threaten their crops; to prune intelligently; to fertilize properly; in fact, to do everything that tends to improve the size, appearance, and quality of their fruit.

There are three things that are of great importance in practically every orchard, viz, fertilization, pruning and thinning. Besides these there are often insect pests or fungous diseases that require attention. Spraying may have to be done to control certain of these, and the man who studies his orchard so that he knows how and when to fertilize, when to prune, when to thin and when to spray for insect pests or diseases, is the man who is going to make the greatest success.

It is true that there are many troubles of the orchard that are not well enough understoood so that they may be controlled, and it is necessary to be constantly alert, ready to experiment with things that promise to give aid, and to co-operate with those who are giving their time to the solution of such problems.

None of the specific problems that we have will be discussed in this article, but from time to time it is hoped that some of these may be taken up in articles for the Bulletin. There are many conditions of soil, climate and locality that must be considered in making recommendations for the care of an orchard. The field worker should bring himself into close touch with all these problems throughout the State that so vitally effect the grade and quality of our fruit.

Many illustrations might be given of good fruit selling for a good price and bringing a nice profit to the grower, while poor fruit on the same market brought nothing. Cases of this kind are familiar to

practically every man who reads the Bulletin and it is not necessary to mention any specific ones.

Too often the fruit grower has been misled to think that success will come easy to any one who owns an orchard. This idea should be discouraged in every way possible. Success will come to the grower who is not afraid to roll up his sleeves and work; who is willing to listen to the advice of neighbors who have succeeded; who is willing to read and determine the best methods in vogue for the various operations of his business. Any man can grow fruit trees and poor fruit, but it takes an orchardist to grow the best trees and the best fruit.

ORCHIDS AND THEIR SCALE PESTS AS FOUND AT THE PORT OF SAN FRANCISCO.

By B. B. Whitney, State Quarantine Inspector, San Francisco, Cal.

The orchids form a vast group of plants, (about 10,000 species). Immense sums are paid for new plants. The price paid for novelties causes collectors to scour every part of the tropics, risking their lives in the mountains, jungles and fever-haunted swamps in search of these plants. It is probable that large sums for single plants have been paid more frequently for orchids than for any other class of plants. Large quantities of orchids are annually imported to replenish hothouses. There never has been any distinct orchid craze followed by a severe reaction, as in the case of the tulip, dahlia, zinnia, camellia, etc., but the interest has gradually extended, and is likely always to increase steadily.

Orchids may be divided into three classes: saprophytes, epiphytes and terrestrial orchids. True parasites are not known to occur in this family.

The saprophytic orchids are the most reduced forms devoid of chlorophyll, and depending for their carbon food upon the organic matter of the humus in which they grow. The subterranean stem or rhizome consists of a much knotted coral-like mass, which takes the place of roots. In most species the rhizome has been found to be infested with a fungus, by means of which organic matter of the humus is absorbed and transformed into compounds available to the plant.

The epiphytic orchids exhibit the most varied forms. These inhabit branches of trees, dead trunks, and often barren rocks, in tropical or subtropical countries where a part of the year is unfavorable to growth. As a result of this they have developed special food reservoirs, pseudobulbs, terminating each season's growth. In this group there are comparatively few plants of attractive habit.

The terrestrial species include some of the largest and most stately orchids of the tropics as well as most of the orchids of the temperate zone. Many of these are ornamental even when not in flower.

Fruit growers, as a rule, are not much concerned about orchids, neither, as a rule, is the quarantine officer, but the latter is vitally concerned about the insect pests that he finds invariably associated with the consignments of these valuable plants that he very often is called upon to examine. The following list of scale insects that the writer has

detected and caused to be destroyed upon orchids entering the port of San Francisco, contains the names of a great number that are well known tree pests in different parts of the world:

The following list contains all the species listed by Cockerell as attacking orchids, excepting seven. It also contains ten species not listed by the same author:

Scale pest.	Habitat.
Conchaspis sps.	Mexico
Asterolecanium epidendri	South America
Ceroputo and *Pulvinaria* sps.	South America
Vinsonia stellifera	Mexico
Eucalymanatus perforatus	England
Coccus acuminatus	Hawaiian Islands
Saissetia hemisphærica	Mexico
Diaspis boisduvalii	South America and England
Diaspis cattleyæ	England
Diaspis echinocacti	South America
Hemichionaspis aspidistræ	England
Hemichionaspis sps.	Manila
Fiorinia sps.	Manila
Aspidiotus cyanophylli	Mexico
Aspidiotus hederæ	Conservatory, Golden Gate Park, San Francisco
Chrysomphalus alienus	London
Chrysomphalus aonidum	Conservatory, Golden Gate Park, San Francisco
Chrysomphalus biformis	South America
Chrysomphalus biformis cattleyæ	Jamaica
Chrysomphalus dictyospermi var. *arecæ*	Golden Gate Park, San Francisco
Lepidosaphes cocculi	Manila
Lepidosaphes pallida	Java
Lepidosaphes sps.	South America
Parlatoria mangiferæ	Singapore
Parlatoria pergandii	Conservatory, Golden Gate Park, San Francisco
Parlatoria proteus	Orient
Parlatoria sps.	Manila
Parlatoria pseudaspidiotus	Recorded in India

The following seven species listed by Cockerell have not been taken so far at the port of San Francisco:

Conchaspis angræci.
Asterolecanium aureum.
Pulvinaria (brassiæ) floccifera.
Ctenochiton elongatus.
Coccus hesperidum.
Fiorinia stricta.
Lepidosaphes pinnæformis.

The working out and identifying of the foregoing material was a task of some magnitude, considering that all of it had to be done during the rare intervals that have occurred in the regular routine work of the quarantine service; but the series of splendid specimens that this work has added to the State collection amply justified the effort.

THE SEED LAW AND THE STATE SEED GROWERS' ASSOCIATION IN WASHINGTON.

By Louise M. Allen, State Seed Analyst, Seattle, Washington.

In 1909 the legislature of Washington enacted a law relating to the sale of and fixing the standard of purity of agricultural seeds. The enforcement of the law was put in the hands of the State Dairy and Food Commissioner. At this time no appropriation was made for carrying on the work, but the legislature of 1911 appropriated funds. The work of establishing a laboratory was at once begun and a seed analyst was appointed.

Briefly, the law is as follows:

All seed dealers are required to label their seeds, giving a statement of their purity and specifying the kind and percentage of the impurities, provided said seeds are below the standards fixed by the act. If they are above the standards, the label may bear the word "Standard."

The sale of seeds containing dodder, quack grass, Canada thistle, corn cockle, wild oats and charlock, is prohibited.

Provision is made for any person who is going to use the seed himself, to have it tested, free of charge, at the State Seed Testing Laboratory.

The department has made the work educational, as far as possible. Farmers' meetings have been held, seed dealers visited and exhibits made at State and county fairs in various parts of the State. In this way the people are told of the idea of the seed law, the advantage of having their seed tested and a card with the address of the laboratory distributed, so that they may send in samples. About four hundred samples were tested last year.

In addition to the educational work the stock of dealers over the State is sampled and tested to show whether their labels are correct. The dealers have complied with the law and poor grades of seed are rapidly disappearing.

Dodder is the commonest of the "noxious" weed seeds, as it occurs in our two most important forage crops, *i.e.*, red clover and alfalfa. Wherever it is found the lot of seed is condemned and the dealer ordered not to sell it in the State. Several carload lots and many lots of a few tons or bags have been condemned and shipped out of the State. One carload of alfalfa, containing approximately one hundred dodder seeds per pound was shipped to Lawrence, Kansas. Another containing some of the same alfalfa and red clover with approximately six hundred dodder seeds per pound was shipped to Milwaukee. A third of alfalfa went to Oregon.

As a result of this movement for better seeds throughout the State, a number of men, interested in the growing of seeds, met at the close of the State Grange meeting in June and formed a temporary organization of the State Seed Growers' Association. Temporary officers, including an executive committee to draft a constitution and by-laws, were elected. The aims of this organization are:

To interest growers in the production of high grade clean seed.

In the production and sale of varieties of seed, true to name, *i.e.*,

applied especially to spring and winter wheat and the different varieties of both of these.

To provide a ready market for such carefully produced seed to which the name "pedigreed seed" is well applied.

For a grower to be able to say that there was neither dodder nor any other weeds growing in the field where his red clover seed was produced should put it far ahead of any of the ordinary sort of seed offered for sale. A large per cent of the red clover seed sold in this country is imported from Europe, where dodder and many other bad weeds are abundant. Our commonest weed pests have, many of them, been brought to us in this way.

The permanent organization of the Seed Growers' Association will undoubtedly be completed in a few months.

With the constantly increasing demand for better grades of seeds, on the part of both farmers and dealers in the State, and the remarkably favorable conditions for seed production here, growing for the market should be a very good industry. It is true that within the last year a vast improvement in the quality of the seed offered for sale in the State is noticeable. With the combined efforts of the Commissioner in charge and Seed Growers' Association, Washington farmers should be able to buy high grade clean seed.

A NEW HOST PLANT OF THE CALIFORNIA GRAPE ROOT-WORM.

(Adoxus obscurus Linn.)

By Edw. J. Branigan, Field Deputy, State Insectary, Sacramento, Cal.

While on a recent trip into the high Sierras engaged in the regular fall field work of locating the winter hibernating quarters of *Hippodamia convergens* Guer., the native ladybird beetle, which is used so extensively by California growers in combating the attacks of various species of aphids, my attention was attracted by the very peculiar insect injury to the leaves and roots of a very large plant (*Saxifraga peltata* Torr.[1]) which grows so abundantly along the borders of swift running streams that in many cases it entirely covers the rocks. The roots extend into the shallow water and the plant sends forth dense foliage in such profusion as to hide the water for some distance. The leaves are very large.

Upon examination of this plant I found the leaves to appear like fine net work, due to the severe attacks of some leaf-eating insect, and upon closer inspection noted that this injury bore a marked resemblance to the injury inflicted upon the foliage of the grape when attacked by the California grape root-worm (*Adoxus obscurus*). The roots also showed a similar injury.

Knowing this insect to occur practically all through the Sierra Nevada Mountains at a great variety of elevations, ranging from the valley as

[1] Jepson in his book—"Flora of Western Middle California"—has the following to say of *Saxifraga peltata* Torr.: "It is a remarkable species of the Sierra Nevada and Yollo Bolly mountains, growing along swiftly flowing mountain streams; it has peltate leaves one to two feet in diameter and petioles two to three and one half feet high."

high as the snow field of Mount Rainier, along the Sierras at an elevation of 10,000 feet, at which altitude a few specimens had been taken, a minute inspection of the work upon *Saxifraga peltata* was made, which showed conclusively that it was done by *Adoxus obscurus,* which at times does considerable damage to vineyards throughout the State.

A careful search of the infested area gave no sign of adults, which was probably due to the lateness of the season. The damage to the foliage was complete, the spaces between the veins of the leaf having the appearance of lace work and the narrow slits, so characteristic of this species on grape, were as thick as they could possibly be, all of which strengthened the belief that *Adoxus obscurus* had adapted itself to a new host plant. Diligent search in this and adjoining areas finally revealed a few adults, which I at once collected together with specimens of leaves showing damage and brought the same to the Insectary, where they were identified as *Adoxus obscurus.* Later, our identification was verified by Charles Fuchs, of the California Academy of Sciences.

The specimens were collected in Canyon Creek, which is a tributary of the north fork of the American River, Placer County, at an elevation of 3,700 feet, during the latter part of October, 1912.

DR. SYLVESTRI'S WEST AFRICAN MISSION.

By Harry S. Smith, Superintendent State Insectary, Sacramento, Cal.

Anything that affects the status of the fruit fly in Hawaii is of vital importance to the fruit growers of California. They will then be interested to know something of the results of Dr. Silvestri's recent trip to the west coast of Africa for the purpose of obtaining, if possible, parasites to use against this pest.

On his way to Italy Dr. Silvestri spent a day at the State Insectary a couple of weeks ago. He reports a most interesting and apparently successful year's work. Leaving his home near Naples the first of July a year ago he proceeded directly to the west coast of Africa. About six months were spent in the search for the fruit fly and its parasites in that region, the remainder of the time being occupied in traveling from place to place, transportation being very poor in that part of the world.

Although a great many species of the fruit fly family were encountered, the Mediterranean fruit fly, *Ceratitis capitata,* was very scarce. However, the habits of these other flies are so similar to that of the particular one which was the object of his search, that it is hoped and believed the parasites attacking these will also attack *C. capitata.* Considerable time was spent in Nigeria and Dr. Silvestri makes the statement that here is the place of all places where the search should be carried on.

Large numbers of various species of fruit flies were collected and parasites reared out and brought to the Hawaiian Islands alive. The greatest difficulty was experienced in keeping the material in a living state, due to the fact that four months were required to make the journey from West Africa to Honolulu. Dr. Silvestri found that the method so successfully used in the gypsy moth parasite laboratory, that of keeping the adult parasites in glass tubes, feeding them with droplets

of honey or sweetened water with a leaf enclosed for the purpose of supplying the proper amount of moisture, was most successful for his purposes. Cold-storage was found to be of practically no value in this particular instance.

Several hymenopterous parasites of the groups *Braconidæ*, *Proctotrypoidea* and *Chalcidoidea* were found and brought to the Islands in a living condition.

The Hawaiian entomologists have been leaders in this sort of work and have carried it on with much vigor, and with Dr. Silvestri to do the collecting, it would seem as though the project should be made a success if the thing can be done. One of the great difficulties with which it is necessary to contend is the fact that the parasites so far discovered, with one exception, are unable to reach the maggots when they occur deep beneath the skin of large fruit such as oranges. The exception mentioned above, is a parasite found by Dr. Silvestri on this trip, which oviposits within the egg of the fruit fly. The maggot hatches from the egg and bores into the fruit, but no matter how deeply beneath the surface it goes it still bears within its body the larvæ of the parasite and will be destroyed before it becomes mature. This parasite would seem to be the most promising of all, and it is to be hoped can successfully be introduced into the islands and that it will thrive in that climate. The growers of this State should follow closely the work of the Hawaiian entomologists, as any reduction in the abundance of fruit flies in the islands means a reduction in our chances of getting it in California. The Mediterranean fruit fly seems to be one of the few insects for the control of which there is little hope in artificial methods, and for this reason Hawaii is abundantly justified in sparing no efforts to secure and establish natural enemies of this pest.

The complete report of Dr. Silvestri on this mission will be published by the Hawaiian Government during the coming year, and should be obtained by all who are interested.

THE BRANCH AND TWIG BORER.

(*Polycaon confertus* Lec.)

Order—Coleoptera. Family—Bostrychidæ.

By E. O. Essig, Secretary State Commission of Horticulture, Sacramento, Cal.

Summary.

1. Considerable damage is often done to young trees by the branch and twig borer (*Polycaon confertus* Lec.).

2. This beetle is not likely to continue destructive enough in any one locality for a period of years to warrant the expense of control.

3. The presence of the beetle is characterized by smooth, round burrows which are usually located in the axils of the buds or small branches or by the broken twigs caused by these burrows.

4. The insects are slender, brown beetles, averaging from three to five eights of an inch long.

5. Control measures consist in cutting out and burning infested twigs and in destroying the beetles in their shallow burrows with a wire.

6. The branch and twig borer is generally distributed throughout the State.

7. The live oak appears to be the native food plant but grapes and nearly all the pome fruit trees are attacked.

Damage.

Within the last two months there have been repeated calls to this office for information regarding an insect which was apparently doing considerable damage to young fruit trees in various sections of the State. The seriousness of the attacks this year led many to believe that a new fruit pest had appeared. In not a few cases young orchards have been seriously injured by the excessive pruning caused by the twigs breaking off at the burrows made by the insect. Large branches are not seriously injured except that the tunnels afford excellent hibernating quarters for other insect pests and ready breeding places for parasitic fungi. The damage to the small twigs is due to the large burrows which so weaken them that they can not sustain their own weight and thus break. Small olive trees have apparently suffered most.

FIG. 339. The branch and twig borer, *Polycaon confertus* Lec. Beginning at the left: beetle at work in burrow; adult female and male beetles; twig showing entrance of burrow; twig broken at the burrow. All natural size. (Original.)

In spite of the above record it does not appear that the insect has ever been a really serious pest except occasionally. Records dating as far back as 1883 show the same conditions to have existed then.

H. F. Wilson and A. L. Lovett[1] report the following conditions in Oregon: "Although apparently never doing any amount of damage, this insect is often found attacking the stems and branches of pome fruits and even grapes. * * * They have never been abundant enough to cause any great alarm, but the burrows offer excellent opportunity for the entrance of fungi and decay organisms."

It is not likely that the insect will become a more serious pest in the future.

[1]Biennial Crop Pest and Horticultural Report, 1911-1912, p. 161.

Work.

The work of the beetle is very characteristic consisting of clean round burrows in the branches extending into the pith or even through to the other side. These burrows are usually from one eighth to one fourth of an inch in diameter and scarcely more than one inch in length. In making these the beetles begin in the axil of a bud or small branch and bore downward. It is not at all difficult to find them doing this.

Appearance and Life History.

The adult beetles are shown in Fig. 339. They vary considerably in size and are usually from three to five eighths of an inch long. They are narrow, the head as wide or slightly wider than the prothorax. The color varies from light to very dark brown and the entire body is covered with short, fine hairs, which are noticeably thick on the head and prothorax. The movements are very slow and deliberate.

The life history of the beetle is very imperfectly known. In 1881, Matthew Cooke[2] recorded it as a pest in California. He supposed that the eggs were deposited in forest trees within which the larvæ subsequently lived. This belief was practically substantiated by the work of Dr. F. E. Blaisdell,[3] who reared adults from larvæ in live oak and almond trees. The writer has been unable to find other records of the young attacking orchard trees.

In all the instances noticed the adults are doing the damage. They work in the spring and early summer, disappearing as suddenly as they came.

Control.

At the present there is no known means of preventing the attacks of this borer. The only remedies suggested are to cut and burn the infested twigs and to destroy the beetles in the burrows by means of a short wire or knife blade. Both of these are tedious and require constant vigilance to be effective.

Distribution.

Matthew Cooke records this insect from Solano and Sonoma counties. Dr. Blaisdell collected it in Calaveras County. The writer has received it from, or collected it in, the following counties: El Dorado, Napa, Riverside, Sacramento, Tehama, Ventura and Yolo. To these Prof. Woodworth adds Mendocino, Santa Cruz, Santa Clara, Contra Costa, Alameda, San Joaquin and Butte.

From the above it will be seen that it is generally distributed throughout the State.

Food Plants.

The list of plants attacked by the branch and twig borer is already large and is likely to increase with the amount of orchard inspection. Those already known are: almond, apple, apricot, cherry, currant, fig, grape, live oak, olive, orange, peach and pear. The native host appears to be the live oak.

[2]Injurious Insects of the Orchard, Vineyard, etc., 1883, p. 116.
[3]Insect Life, Vol. V, p. 34.

GENERAL NOTES.

THE INTRODUCTION OF CALOSOMA FOR USE AGAINST THE OAK MOTH.

During the past month the California oak moth, *Phryganidia californica*, has been doing very serious damage to oak in this State and especially in the Santa Clara Valley. Entire defoliation is a common occurrence, and with the coming on of the second brood very serious damage will probably be done, although this may be prevented by the attack of the native parasites which are sometimes sufficient to hold it in check. The recurrence of this moth every season has led us to believe that an attempt to introduce *Calosoma sycophanta* to prey on this worm would be well worth while. *Calosoma sycophanta* is a large green beetle very similar in appearance to our *Calosoma scrutator*, but is much more valuable for the reason that the larvæ of this imported beetle are more proficient in tree climbing. *Calosoma sycophanta* has been introduced by the U. S. Bureau of Entomology into New England for use against the gypsy moth, and this introduction has been an eminent success. It is probable that this beetle is, up to the present time, the most efficient of all of the introduced enemies of the gypsy moth. The credit for the successful outcome of the experiment in New England is due to Mr. A. F. Burgess and it is through his kindness and that of Dr. L. O. Howard, Chief of the Bureau, that we are supplied with a stock of these beetles for use in this State.

The insect is a native of South Europe, being found commonly in Southern France, Italy and Sardinia. While the gypsy moth is probably the food most preferred by *Calosoma sycophanta*, it also feeds voraciously on many other varieties of caterpillars, and there is but little doubt that it will find the California oak moth very much to its liking. The fact that this moth is present through a rather long season, it having more than one generation, and the similarity of our climate to that of the native habitat of this beetle, leads us to hope that it will thrive in California and become a valuable factor in the control of this pest. As oak trees are difficult to spray and as the operation is very expensive, we believe that this is one of the instances where no effort to obtain control through natural enemies should be spared. Besides the oak worm we have the fall-web worm, several species of tent caterpillars, several tussock moths, the canker worms and the red-humped caterpillars, all of which should form food for this beetle.—Harry S. Smith.

ARSENATE OF LEAD VS. PARIS GREEN.

For years, Paris green, and later London purple, were the almost exclusive arsenical poisons used to combat mandibulate or biting insects. Owing to the fact that the commercial acids were in part soluble they often blighted seriously the foliage of the plants that they were used to protect. Often it was impossible to use them strong enough to kill the insects without at the same time blasting the plants.

Prof. C. P. Gillette did a signal service when he discovered that by using four or five pounds of freshly slaked lime to each pound of the poison he could diminish the injury to the plants materially. This converts the soluble arsenious acid into an insoluble arsenite of lime. Yet this increased the work and was not always satisfactory.

Then came arsenate of lead. This can be used as strong as four pounds to one hundred gallons of water with no harm to the plants. The powdered article can be used often very effectively mixed with dry wood ashes, pound for pound. In this case a dust gun makes the work easy and rapid. In case the powder is used in lieu of the liquid a still day is necessary, and it is best applied when the plants are wet with dew.—A. J. Cook.

A TENEBRIONID BEETLE INJURING BEANS.

A small black Tenebrionid beetle, which has been identified by Dr. Chittenden of the Bureau of Entomology, as *Coniontis subpubescens*, has been found this season doing a great amount of damage on about 100 acres of beans near Oxnard. The adult beetles were found in large numbers feeding on the tender stocks just after they came through the ground. The stand of beans was almost completely ruined. While this beetle has been observed for some years in southern California, Dr. Chittenden advises the writer that this is the first report of damage done by it which has ever been received by the Department. Another of the common scavenger Tenebrionids (*Blapstinus* sp.) has been reported before, but not as being so severe in its work as is this one. The field attacked is some distance from other bean fields, and it does not appear that the pest will spread. It has also been observed that poison baits used for cutworms kill considerable numbers of these beetles when they are present in the fields, so that control in case it became necessary should be fairly simple.—R. S. Vaile.

MONTHLY CROP REPORT—JUNE.

These data are compiled by the secretary from monthly crop reports made by the county horticultural commissioners. Counties not included have not reported or the reports have come too late for preess. Unless otherwise designated percentages refer to last year's crop.

Alfalfa.

Reports still indicate a good crop of alfalfa throughout the State, although in a few sections the dry season will materially decrease the output.

Almonds.

10 per cent increase over report of last month in Contra Costa County and 60 per cent over last month's estimate of 10,800 pounds in Madera County. Ventura County reports an increase of 25 per cent over last month's report or a crop about equal to that of last year.

In other sections the conditions as reported last month have not changed materially.

Apples.

A 10 per cent increase over last month is reported from Butte County, while a 10 per cent decrease is reported from El Dorado County. A 5 per cent decrease shows on the report from Sacramento County. Shasta County reports from 50 to 60 per cent of last year's crop. Sonoma shows an increase of 5 per cent and Stanislaus a 25 per cent gain over last month's estimate.

In other sections the estimates of last month still appear accurate.

Apricots.

In Alameda County the conditions look better than the last report, showing an incrase from 50 as last reported to 75 per cent. Fresno County reports a gain of 50 per cent over last month's estimate. Madera reports 30 per cent of last year's crop (dried) of 64,000 pounds. Merced has only 10 per cent of normal crop. There is a decrease of about 60 per cent over last month's estimate for Monterey County. In Orange County the crop is only 30 per cent, but the fruit is in fine condition and will be of good size. There is a decrease of 15 per cent in the estimate of Sacramento County for this month, while San Bernardino has an increase of 5 per cent. Santa Cruz reports 70 per cent of full crop due to drought. Tehama County reports an increase of 50 per cent over last month's estimates, while Ventura reports a gain of 10 per cent.

Other counties report no material changes.

Beans.

Orange County estimates 80 per cent of a crop. Sacramento reduces last month's estimate from 100 per cent to 75 per cent of last year's crop. No other changes recorded. There are indications of a fair crop.

Berries.

A good crop reported throughout the State.

Cherries.

Practically all are harvested. There was a somewhat larger crop throughout the State than was estimated in last month's report, though a few sections fell short of it.

Figs.

In Butte County the first crop is heavier than usual. A much better crop is expected in Madera County than was reported last month. A large crop is also estimated for Merced County and a good crop for San Joaquin County. In Stanislaus County the crop is reported to be 25 per cent greater than last month's estimate and 15 per cent greater in Tulare County.

In other sections there have been no changes in the estimates.

Grapes (Wine).

Reliable estimates have been received relative to this crop and all indications point towards a fair yield throughout the State. Alameda reports but 50 per cent, Madera 115 per cent. A short crop is reported in Merced and San Joaquin counties, while Sonoma, San Bernardino, Sacramento, Los Angeles and Fresno report fair or good crops.

Grapes (Table).

Fresno, Los Angeles, Madera, Stanislaus and Sonoma report full crops. Tulare, Sacramento and San Bernardino report 90 per cent, while San Joaquin estimates a short crop.

Hops.

All reports so far received indicate that the hop crop will be about the same as that of last year.

Lemons.

There appear to be no improvements in the prospects for a lemon crop over those given in last report. If anything it will be slightly less than was estimated at that time.

Olives.

Butte—75 per cent. *Madera*—150 per cent. *Merced*—full crop. *Orange*—80 per cent of crop which is double that of last year. *Sacramento*—90 per cent. *San Bernardino*—95 per cent. *Stanislaus*—150 per cent. *Tehama*—100 per cent. *Tulare*—75 per cent. In other sections the former estimates remain unchanged.

Oranges.

Butte—50 per cent. *Los Angeles*—twice the crop of last year which was very short. *Orange*—80 per cent. Navels set well—about 90 per cent. Valencias dropping and will be about 70 per cent of last year. *Riverside*—65 per cent of normal. *Sacramento*—95 per cent. *San Bernardino*—70 per cent. *Sonoma*—50 per cent. *Tehama*—100 per cent. *Tulare*—65 per cent. *Ventura*—shipping heavily of Valencias now. Good setting. Other estimates remain the same.

Peaches.

Alameda reports an increase of 5 per cent over last month's estimate. *Contra Costa*—reports half a crop. *El Dorado*—60 per cent. *Lake*—40 per cent. *Madera*—100 per cent. *Merced*—40 per cent. *San Bernardino*—95 per cent. *San Joaquin*—two thirds normal crop. *Shasta*—25 per cent to 30 per cent. *Sonoma*—65 per cent. In other counties there is no change over last month's estimates.

Pears.

Alameda—75 per cent. *Butte*—shows a slight increase over last month. *Contra Costa*—50 per cent. *El Dorado*—50 per cent. *Lake*—60 per cent. *Mendocino*—50 per cent. *Santa Cruz*—80 per cent. *Shasta*—40 to 60 per cent of crop. Other counties report no change of last month's estimates. Most of the localities show an increase over last report indicating a better crop than was at first expected. The quality of the fruit will be excellent.

Plums.

In Alameda County the crop will be about 45 per cent because of the dry season. *Sonoma*—reports an increase of 5 per cent over last report. *Stanislaus*—gains from 35 to 75 per cent. *Tulare*—60 per cent instead of 50 per cent. Other counties report same as last month. A very good crop is assured.

Potatoes.

The crop throughout the State will be from 75 to 90 per cent of last year's according to all estimates received.

Prunes.

The prune situation has not materially changed. Though only about half that of last year the sizes and quality are exceptionally good.

Walnuts.

Alameda—75 per cent. *Los Angeles*—75 per cent. *Merced*—full crop. *Orange*—120 per cent. Nuts beginning to drop, though blight does not appear to be severe. *Riverside*—100 per cent. *Sacramento*—80 per cent. *San Bernardino*—100 per cent. *San Joaquin*—good crop. *Stanislaus*—150 per cent. *Tulare*—60 per cent. *Ventura*—90 to 95 per cent. Very little blight. Other localities remain as last reported. The blight is reported to be less in evidence than in many years. A good clean crop is apparently assured.

General Summary of California Crop Conditions.

The following estimated conditions on June 1, 1913, with comparisons of the principal crops in California, on the basis of 100 representing a normal crop, is reported by the Crop Reporter of the U. S. Department of Agriculture, as follows:

	1913.	1912.	1911.
Apricots	68	85	57
Almonds	55	85	67
Prunes	73	88	69
Olives	87	92	93
Walnuts	77	88	81
Oranges	70	90	97
Lemons	60	88	95

GENERAL CROP CONDITIONS.

The Pacific Northwest.

Reported by the Northwestern Fruit Exchange.

Oregon: (Rogue River Valley).

Apples—Some apple trees that bore heavily in 1912 will only have half crop. Young orchards will more than make up the shipment of last year or 550 cars.

Pears—A 25 per cent increase is expected or 400 cars.

Peaches—75 per cent of normal crop.

Prunes—80 per cent of normal crop. This estimate takes into consideration a loss by frost of approximately 60,000 boxes.

(Williamette Valley.)

Apples—Most of the apples in this district are used locally and in by-products. Outside shipment will not exceed 100 cars. Crops will be lighter than last year.

Pears—Average crop will be normal.

(Hood River District, including Mosier, White Salmon and the Dalles.)

Apples—This is the off year for some old orchards, but younger orchards are expected to bear enough to bring total crop up to that of 1912, or around 1,200 cars.

Prunes—Normal crop.

(Eastern Oregon.)

Apples—This will be an off year for Ben Davis, Gano and York Imperials while Rome Beauty and some other varieties will show an increase, probably an average of 75 per cent of 1912 crop. No frost damage.

Pears—Two thirds crop on account of too much rain while blooming.

Prunes—Half crop. *Cherries*—Full crop.

Washington: (Wenatchee District).

Apples—4,328 cars as against 3,495 in 1912.

Pears—139 cars as against 200 in 1912.

Peaches—410 cars as against 491 in 1912.

Apricots, Plums and *Cherries*—732 cars or 78 per cent of normal.

(Yakima Valley.)

Apples—A great many trees bore so heavily last year that they did not bloom this year. Probable crop 60 per cent of 1912 or 3,000 to 4,000 cars.

Pears—Frost damage will reduce this year's crop to about 200 cars.

Peaches—Some frost damage reported, but not very general, and there may be 1,500 cars this year.

Prunes—Will be light crop, probably less than 100 cars.

Cherries—Half crop on account frost. Probably 20 cars.

(Walla Walla.)

Fruit crop expected to nearly equal crop of 1912.

(Dayton-Waitsburg.)

50 per cent of normal or 80 cars of apples. Other fruits heavy crops.

(Spokane District.)

Apples—Damaged by frost in some spots. Crop will be lighter than 1912.

Other States and Canada.

Reported by the Northwestern Fruit Exchange.

In condensed form, we give the reports at hand, most of which were written within the last two weeks. We again state that this report can not be considered as an absolute prediction as many conditions are bound to change from month to month, and of these changes, we will endeavor to keep you informed. As an off-hand summary, we may note that the apparent net decrease is only 6,000 to 8,000 cars of apples, or about 3 1-3 per cent of the 1912 crop.

Arkansas:

Apples generally bloomed full. Jonathan not setting well. Ben Davis light.

Peaches—Southern part of the state has full crop. In Benton and Washington counties, crops will be above normal. Around Fort Smith and Van Buren, crop reduced to 50 per cent. Other districts 70 to 90 per cent. State may average 70 per cent.

Canadian Provinces:

Apple prospects are generally optimistic.

Pear growing sections report conditions very favorable.

Nova Scotia 1912 was off year, 5,000 cars. 8,000 cars expected 1913.

British Columbia *apple* crop above normal in 1912. 80 per cent of last year's crop expected for 1913.

Pears—110 per cent of last year expected.

Peaches—Some lighter than last year.

Prunes—85 per cent of last year's crop.

Colorado—Western slope:

Apples—Spring frost reduced crop to 50 per cent or 1,200 to 1,500 cars.

Pears—Spring frost damaged crop one half.

Peaches—Winter freeze and spring frost did great damage. Prospect not over 50 per cent crop, or 900 cars.

Eastern part:

Apples—Prospects are good for double the 1912 crop. 1,000 cars of apples are expected.

Pears—Double 1912 crop expected. *Peaches* likewise.

Connecticut:

Apples—The 1912 crop was light, but we have had a very favorable season so far. Expect 250 per cent of crop or 3,500 cars.

Peaches in this state and all New England will be a big crop or 300 per cent of last year's crop, notwithstanding some damage by frosts

Delaware:

Apples—Expect 40 per cent crop.

Peaches—Expect about 40 per cent crop.

Pears—About 25 per cent of full crop expected.

Florida:

Normal crop *oranges;* a little short on *grapefruit.*

Georgia:

Apples—Expect a record crop for the state, or three times last year's.

Peaches—Estimates of crop vary from 1,300 cars to 2,500 cars. Probably the closest estimate is around 1,800 to 2,000 cars.

Indiana:

Apples—Expect larger crop than last year except Ben Davis. Many conditions are unfavorable. Commercial orcharding in the state does not amount to much.

Illinois:

Apples—Promise the largest crop in twenty years, although in restricted areas there has already been a severe drop on account poor pollenization and twig blight.

Idaho:

Incomplete reports indicate normal crops for the state.

Iowa:

Apples—65 to 90 per cent of normal crop. Considerable loss caused by canker worms. *Pears* promise nearly a full crop.

Louisiana:

Peaches—50 to 75 per cent of normal crop expected.

Michigan:

Apples—Normal crop of 8,000 to 10,000 cars expected.

Pears—75 per cent crop in sight or 1,500 cars. (Damage by frost.)

Peaches—May frosts reduced the crop approximately one third. Crop now expected 3,500 cars.

Missouri: (Calhoun County).

Apples—Ben Davis will be around a half crop. Others nearly normal. As Ben Davis is about half of all grown, the total crop will be reduced about 25 per cent, leaving prospect of 900 cars.

Peaches—In the Ozarks, full crop. Elsewhere in the state averages more than 1912.

Montana:

Apples—A full crop expected or 500 cars. Some older orchards show a decrease, but new ones make up for it.

Nebraska:

Apples—Crop will be about same as last year or 1,500 cars. Jonathans are heavy while Winesaps and Ben Davis are light.

New Jersey:

Apples—Prospect for heavy crop throughout state.

Pears and *Plums*—Very light.

Peaches—Damaged 30 to 40 per cent by frosts.

New Mexico:

Apples—200 per cent of last year's crop or 1,200 cars.

Pears—200 per cent of last year's crop or 200 cars.

Peaches—200 per cent of last year's crop or 400 cars.

Prunes—200 per cent of last year's crop or 100 cars.

North Carolina:

There has been a heavy drop on nearly all kinds of fruit.

Apples will be a 40 per cent crop.

Pears will be a 15 per cent crop.

Peaches will be a 68 per cent crop.

Ohio:

Apples—There will be plenty in the northwestern part of the state, or Lake District, which is the principal fruit growing district. Central and eastern Ohio was hard hit by the May freeze, and practically all fruit was killed.

Oklahoma:

Apples—Full crop expected.

Pears and *Peaches*—Light crops expected.

Pennsylvania:

Apples—Last year's crop was light. This year the bloom was very heavy, but sets have dropped somewhat. Indications are for 150 per cent crop as compared with 1912, or 3,500 cars.

Peaches—Will be light and all be consumed in the state.

New York:

Apples—Western New York raises principally Baldwins and this variety will be light crop following big crop of 1912. All other varieties heavy crop, especially Greenings. No damage of note by frost. Size and general quality expected to be better than ever. Average crop may be 85 per cent of last year.

Pears—Heavy crop—200 per cent of last year.

Plums—Fair crop.

Peaches—About 50 per cent of last year, but up to normal average.

Cherries—Damaged in some localities.

Grapes—Damaged to some extent.

INSECT NOTES.

Mr. Harry S. Smith, superintendent of the State Insectary, has received a small weevil from Mr. Richard Baird of Inyo County, who reports it as doing considerable damage to the buds of apples during the past spring just as they are opening. Dr. Van Dyke determined the weevil as *Eupagoderes mortivallis*. It is considerd as a rather rare form.

This spring the onion thrips, *Thrips tabaci* Lind., has been found attacking cantaloupe vines. All stages of the insect occurred on the vines and produced a mottled effect on the upper surface of the leaves. It was found generally distributed throughout the Brawley district, but only serious in a few small patches. Onion fields are generally infested—some of them severely so.

The large light-colored, circular scale so common on the foliage of the manzanita in the higher altitudes of the Sierra Nevada Mountains has been described as a new species, *Aulacaspis manzanitæ*, by B. B. Whitney, state quarantine inspector at San Francisco. This scale is often mistaken by the growers in those regions for San Jose and other orchard scales.

The pear slug, *Caliroa cerasi* Linn., is reported by certain growers to be unusually abundant along the Sacramento this season.

The alfalfa caterpillar, *Eurymus eurytheme* (Boisd.), is doing some damage to alfalfa in Imperial County.

Many specimens of the common grain thrips, *Euthrips tritici* Fitch, have been received from growers who feared damage would be done to the alfalfa fields. This insect is exceedingly common and abundant in the blossoms of alfalfa, but so far has not been reported as doing any considerable damage to the crop. It is especially abundant in the Imperial Valley and other sections in the southern part of the state, and is easily recognized by the orange-colored thorax.

The small scarabæid beetle, *Serica alternata* Lec., is quite abundant along the beach at Ventura, Califorina. S. H. Essig collected great quantities of it there during the middle of May.

The red-humped caterpillar, *Schizura concinna* S. & A., has already appeared in many districts of the Sacramento Valley. Prompt sprayings with arsenate of lead form a ready means of controlling this pest.

The raspberry horntail, *Hartigia cressoni*, is doing considerable damage to loganberries, roses, blackberries and raspberries in the vicinity of Sacramento.

The grasshopper which has been doing much damage in the Sacramento valley this spring proves to be the devastating grasshopper, *Melanoplus devastator conspicuus* Scudd. Its ravages have been particularly severe in some orchards.

Mr. G. P. Weldon, chief deputy commissioner, reports cicadas quite abundant in an olive orchard near Chico. The adult insects were puncturing the small twigs and depositing their eggs therein. The species has not yet been identified.

A small weevil has been collected in Ventura County by S. H. Essig, who, with Mr. Vaile, horticultural commissioner, reports it doing considerable damage to the foliage of apricot trees in Ventura County. The leaves and tender twigs are attacked.

A small yellow scale, *Aspidiotus britannicus* Newst, has been found abundant on the leaves of imported bay trees from Holland.

E. J. Vosler, assistant superintendent of the State Insectary, has returned from a two weeks' scouting trip for the alfalfa weevil, *Phytonomus posticus* Gyll. The alfalfa fields along the Salt Lake Route in the Mojave Desert between Daggett and Victorville were thoroughly examined, but fortunately no trace of this pest could be found. This newly settled region which is mainly watered by pumping plants has an acreage in alfalfa of approximately 500 acres. The alfalfa fields in the Imperial Valley were also examined with a negative result.

He also reports that in the Imperial Valley little damage is being done to the melon vines by the melon aphis, *Aphis gossypii* Glover. The practice has been to destroy the infested vines by burning, as soon as the aphis is detected. The melon season for the valley closed about July 15th.

NOTES FROM THE COUNTY COMMISSIONERS

Glenn County.

Mr. Carl J. Ley has been conducting successful control measures against grasshoppers, which have been quite plentiful in his county.

Humboldt County.

Mr. George B. Weatherby reports considerable damage to loganberry bushes by a leaf miner.

Imperial County.

The supervisors have asked the state board of horticultural examiners for an examination to qualify eligibles for county horticultural commissioner. Due to his many other duties Mr. Wilsie is unable to continue in this office.

Kings County.

Mr. B. V. Sharp has been unable to assume his duties during the past few months because of sickness. We are happy to hear of a gradual improvement in his condition.

Merced County.

Mr. W. H. Wilson, after quite a long illness, has again resumed active work in his county, beginning with a campaign against the Russian thistle.

Shasta County.

Mr. George Lamiman has reported good success in the destruction of grasshoppers by burning.

Tulare County.

Mr. A. G. Schulz reports mildew as doing considerable damage to peaches over small areas in his county.

QUARANTINE DIVISION.

Report for the month of May, 1913.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco.

SAN FRANCISCO STATION.

Horticultural imports.

	Parcels.
Ships inspected	43
Passed as free from pests	78,963
Fumigated	1,625
Destroyed	138
Returned	10
Contraband	76
Total parcels horticultural products for the month	80,812

Pests intercepted.

From Honolulu—
Diaspis bromeliæ and *Pseudococcus* sps. on pineapples.
Cylas formicarius and *Omphisa anastomosalis* in sweet potatoes.
Aphids on betel leaves.
Larvæ of *Ceratitis capitata* in tomatoes.
Larvæ of *Dacus cucurbitæ* in cucumbers.
Hemichionaspis minor and *Aspidiotus lataniæ* on plant sps.

From Japan—
Eggs of *Bruchus* sps. in seeds.
Aulacaspis pentagona on peach, cherry and rose.
Aspidiotus sps. on juniper.
Pseudaonidia pæoniæ on azaleas.
Pseudaonidia duplex on camellia.
Parlatoria ziziphus on maple.
Pseudococcus sps. and *Aphis* sps. on pine tree.
Parlatoria pergandii on camellia.
Chionaspis citri on orange.
Aleyrodes citri on citrus trees and gardenias.

From Florida—
Diaspis bromeliæ and *Pseudococcus* sps. on pineapples.
Lepidosaphes beckii, Parlatoria pergandii, Phomopsis citri and *Leptothyrium pomi* on grapefruit.

From New York—
Diaspis boisduvalii on orchids.

From England—
Coccus hesperidum and *Diaspis boisduvalii* on orchids.

From Belgium—
Coccus hesperidum and *Aspiodiotus britannicus* on bay.

From Papeete—
Aspidiotus lataniæ on sapotes.

From Manila—
Weevils in palm seeds.

LOS ANGELES STATION.

Horticultural imports.

	Parcels.
Ships inspected	19
Passed as free from pests	73,468
Fumigated	1,442
Destroyed	1
Returned	0
Contraband	0
Total parcels horticultural products for the month	74,911

Pests intercepted.

From Belgium—
Coccus hesperidum and *Aspidiotus britannicus* on bay.
Orthezia insignis on evergreen.
Hemichionaspis aspidistræ on Aspidistra lurida.

From Cuba—
Pseudococcus sps. on pineapples.

From Florida—
Eucalymnatus perforatus, Ischnaspis longirostris, Chrysomphalus ficus, Chrysomphalus aurantii and *Aleyrodes* sps. on mango.
Eucalymnatus perforatus on palm.
Pseudococcus citri on croton.
Pseudococcus sps. on pineapples.

From Germany—
Pseudococcus sps. on cactus.

From Holland—
Lepidosaphes ulmi on boxwoods.
Aphids on Norway pines.

From Massachusetts—
Pseudococcus citri on ferns.

From New Jersey—
Pseudococcus citri on acacia.

From Pennsylvania—
Chrysomphalus aurantii on palm.

From Texas—
Lepidosaphes beckii on pomelo.

From Turkey—
Phœnicococcus marlatti and *parlatoria blanchardii* on date palms.

SAN DIEGO STATION.

Horticultural imports.

	Parcels.
Ships inspected ---------- 14	
Passed as free from pests ----------	1,984
Fumigated ----------	3
Destroyed ----------	3
Contraband ----------	5
Total parcels horticultural products for the month ----------	1,995

Pests intercepted.

From Ohio—
Pseudococcus sps. red spider, *Aleyrodes* sps. and *Coccus hesperidum* on citrus plants and camellia.
Orthezia insignis on lantana.
Pseudococcus longispinus on poinsettia.
Aleyrodes citri on citrus stock.
Aleyrodes sps. on hibiscus.

SANTA BARBARA STATION.

Ships inspected ---------- 2
No horticultural imports.

EUREKA STATION.

Ships inspected ---------- 4
No horticultural imports.

Acc- 6147

TWO FUNGI AS CAUSAL AGENTS IN GUMMOSIS OF LEMON TREES IN CALIFORNIA.

(*Botrytis vulgaris* and *Pythiacystis citrophthora.*)

By H. S. Fawcett, Plant Pathologist, State Commission of Hortculture, Whittier, Cal.

Introduction.

The term "Gummosis," or lemon gum disease, will be restricted in this article to that condition described by Professor R. E. Smith and O. Butler, in Bulletin 200, of the California Experiment Station. It is characterized by dying of areas of bark, accompanied by the exudation of gum, usually somewhere on the trunk from above the bud union to the forks of the branches. The word Gummosis, as used by Professor Smith, and as used here, does not apply to the formation of gum in the small branches, leaves or fruit, nor to mere gumming that is entirely unaccompanied by dying of bark. Mere gum formation in citrus trees may take place as a result of chemical stimuli or other causes, but this is not included under the word gummosis. In some respects, it would be better to use for this disease a term such as "bark rot," since the dying of the bark rather than the formation of gum is what results in serious injury and justifies the term "disease." Gummosis is a definite disease, mere gum formation alone is not a sign of any one specific disease, but since misunderstanding is likely to arise in making changes in names, the term Gummosis, expressing a definite result of the disease rather than the cause, had best be retained. That at least two forms of this disease are induced in healthy trees by two fungi (commonly known in the packing-houses as the brown rot fungus and the grey fungus) have been discovered as the result of a series of experiments during the past year.

The commonly held view that all forms of this disease in California were physiological, and that they were due to some deranged condition of the tree itself, brought about entirely by unfavorable soil, climatic or cultural conditions, was a natural inference from the commonly observed fact that the larger percentage of the cases of gummosis occurred where unfavorable soil or cultural conditions existed, such as poor drainage, soil above the bud union, excessive amount of water, etc. So well was this relation between unfavorable conditions and gummosis recognized by growers and those previously studying this disease that fairly successful methods of dealing with it had been worked out by them and put in practice by some of the most successful orchardists. The work previously done by Professor R. E. Smith* and others in obtaining a thorough understanding of the causal conditions (poor drainage, soil above the bud union, etc.) served as an excellent basis on which to carry further the work in determining some of the causal agents (the fungi). It would seem now that the success of the methods

*Smith, R. E., and Butler, O., Gum Diseases of Citrus Trees, California Experiment Station, Bulletin 200, 1907.

employed in preventing gummosis was due to the bringing about of conditions that were unfavorable either to the infection by the causative agents or to their development, or to both. These recognized methods of prevention are important and can not be emphasized too strongly. Keeping the soil away from the bud union, getting good drainage, using sour orange stock for heavy soils, using high budded lemon trees planted high for all new plantings, are important precautions that should not be neglected.

It remained true, however, that in spite of all the care that could be exercised, certain cases of gummosis kept recurring, which appeared not to be accounted for merely on the ground of unfavorable soil and cultural conditions. While the avoidance of these unfavorable soil and cultural conditions was recognized by all growers as extremely important in preventing the disease, and while the usual treatment of slitting and painting with pure neat's-foot oil appeared to be successful in some places, a number of growers felt that this treatment was inadequate, and that the use of impure neat's-foot oil had injured many trees.

The writer had, while in Florida, with the help of Mr. O. F. Burger, proved that a gumming of orange and peach trees, accompanied by killing of the bark and wood, was induced by a fungous growth, *Diplodia natalensis*.[1] On coming to California he was confronted with the question as to whether fungi might not also play a part in gummosis of lemon trees. It was well known that gumming took place in connection with the attack of the peach blight fungus *Coryneum beyerinkii*.[2] A form of gumming of cherry trees in Oregon had recently been reported as due to a bacterium.[3] A number of fungi had been reported, also, as causing gumming of peach, apricot and citrus trees in foreign countries.

Professor Ralph E. Smith, at the Southern California Pathological Laboratory, in talking the situation over with the writer, suggested that further work be taken up on gummosis and other similar troubles, to determine whether or not organisms had any relation to them. It was for this reason and also because of the promise of hearty co-operation by several growers that the work was first taken up in February, 1912.*

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[1]Mycologia III, 151–153; also Annual Report of the Florida Agricultural Experiment Station for 1911, pp. 61–65, and same for 1912, pp. 77–81.

[2]Smith, R. E., California Peach Blight, Bul. 191, California Experiment Station, 1907.

[3]Griffin, F. L., Science N. S. 34, p. 615, November, 1911; Barrs, H. P., Cherry Gummosis. Biennial Crop Pest Report for 1911–1912, Oregon Agricultural Experiment Station.

*To Mr. J. D. Culbertson, of the Limoneira Ranch, Mr. R. S. Vaile, County Horticultural Commissioner of Ventura County, and to Mr. J. A. Prizer, of the San Diego Fruit Company, is due the credit for having suggested and for having helped initiate the experiments on which the results hereafter described are based. The success of the work is also due to the hearty co-operation of Mr. C. C. Teague, of Santa Paula, Mr. J. E. Boal, of National City, and Mr. L. B. Barnes of Chula Vista, who were instrumental in furnishing valuable trees and facilities for carrying on the work. The Southern California Pathological Laboratory at Whittier, through Professor R. E. Smith and his staff, aided and encouraged the work most generously by furnishing room and allowing the use of valuable apparatus and other facilities. The Citrus Experiment Station at Riverside, through Dr. J. E. Coit, also furnished a number of trees for one series of inoculation experiments. Help was also given freely by many others, especially by Mr. Milo Hunt, of Whittier, in furnishing a number of valuable nursery trees for some of the experiments. Mr. John King, of Whittier, also furnished a few citrus trees for one of the experiments.

Lines of Investigation.

Was gummosis infectious? Inoculations were first made to determine either the infectious or non-infectious nature of certain forms of gummosis. Cuts were made into the bark of large, healthy lemon trees and bits of material from diseased trees inserted. It was found that typical cases of gummosis (the dying of large areas of bark and the exuding of gum) could be induced on perfectly healthy lemon trees in three to four months by bits of discolored bark or wood taken from the advancing edges of diseased areas of naturally occurring cases of gummosis. Bits of exuded gum or pieces of tissue already permeated with gum from these same trees failed to transmit the disease when placed in cuts in the bark of healthy trees. This result appeared to explain why inocu-

FIG. 340.—Lemon tree inoculated by inserting under the healthy bark a bit of gummosis bark from a diseased tree March 8, 1912; photographed June 27, 1912, to show exuding gum. (Original.)

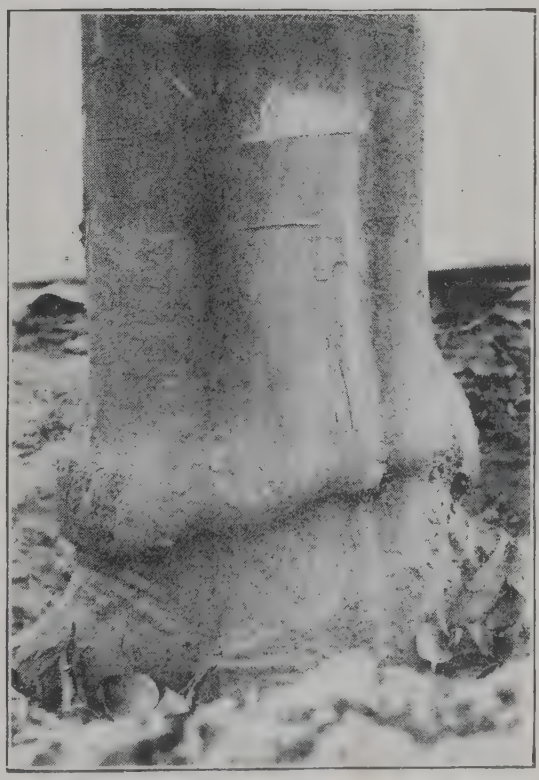

FIG. 341.—Opposite side of same tree shown in Fig. 340: bark cut without intion of diseased tissue. (Original.)

lation by previous workers had failed. The infectious principle was not in the gum itself, but in the diseased bark and at the margins of the enlarged areas, and therefore inoculation with the gum alone had failed to transmit the disease. It was also found that the younger the trees the more resistant they seemed to be to the effect of inoculations. Young nursery stock could readily be induced to gum, but usually healed up again without further progress of the disease. In older trees, however, the gumming continued and the area of killed bark slowly increased.

Fig. 340 shows the beginning stages of gummosis from one of the inoculations with diseased bark in a healthy eighteen-year-old lemon tree. Fig. 341 shows a cut not inoculated in the opposite side of the same tree, which has healed perfectly. This tree was inoculated at Santa Paula March 8, 1912, by inserting a small bit of bark from a diseased tree. The photograph was taken on June 27th, over three months later. By November the bark was killed over an area of six

FIG. 342.—Lemon tree inoculated by insertng into healthy bark a bit of diseased bark from another tree nearly dead with gummosis February 27, 1912. Photographed August 2, 1912, to show the characteristic infection. (Original.)

inches long and three inches wide, and gum was running out four inches farther up than in the illustration. At the present time the area of killed bark is nine inches long and four inches wide, but the cut (Fig. 341) on the opposite side is closed with healthy new bark.

Figures 342 and 343 show a more rapid development of gummosis as the result of inoculation with diseased bark into a healthy tree at Chula Vista, and is a form of gummosis different from Figure 340. The tree

shown in Figure 342 was inoculated on February 27, 1912, with a bit of bark from a tree just about to die. It was first noticed to be gumming on May 24th. Figure 342 was photographed August 2d, and Figure 343 September 19, 1912. The leaves on the side of the tree which was gumming showed a decided yellowing, while the other side was still green. By March 11, 1913, there was left only four inches of live bark on the opposite side. Cuts into other trees inoculated with healthy bark healed perfectly without gumming. Many other trees inoculated at the

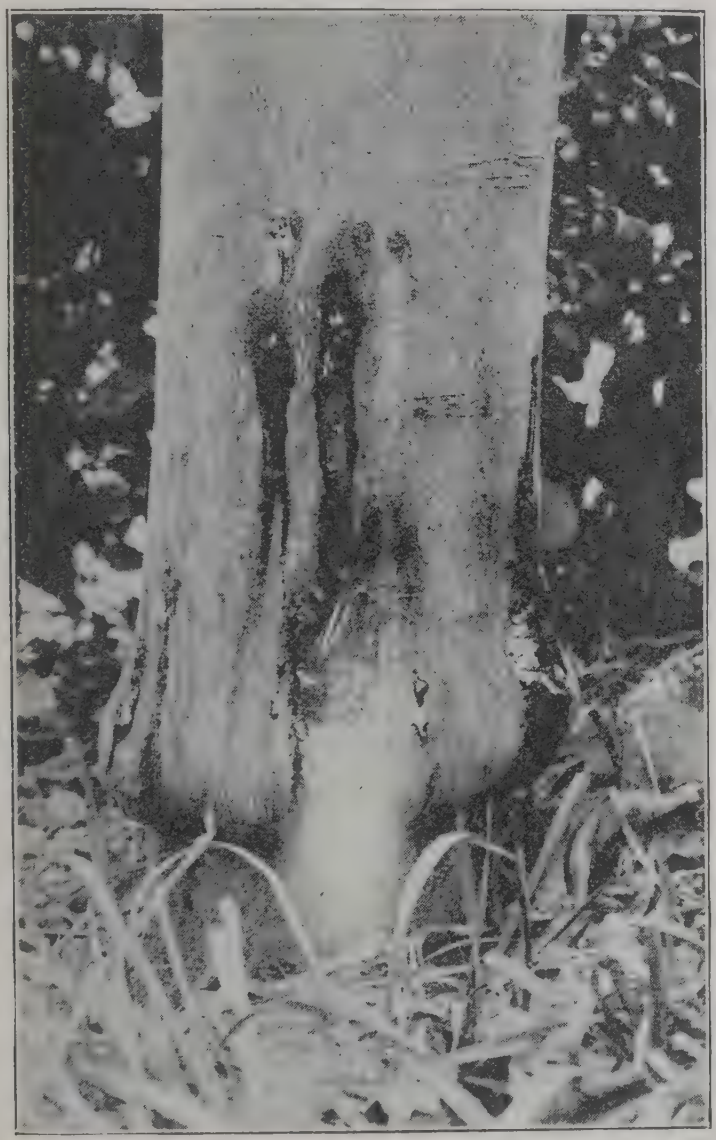

FIG. 343.—Same tree as in Fig. 342 photographed September 19th to show the rapid progress of the disease. (Original.)

same time and also at later dates with diseased tissues were similarly affected.

The Causal Agents: Having found that the disease was transmissible, the next step was to find out what the agent or agents were that were capable of transmitting it. In making the first studies of lemon gummosis in the orchards it had been noticed that there were at least two forms of the disease: one in which the outer layer of bark was killed much in advance of the inner and in which there was some softening of

the bark, and another in which the killing of the inner bark lagged only slightly behind that of the outer and in which the bark remained hard as the areas of infection enlarged. As will be shown later, the former is caused by the grey fungus (*Botrytis vulgaris*) and the other by the brown rot fungus (*Pythiacystis citrophthora*), both commonly known as causing fruit rots in the citrus orchards and packing-houses of California.

FIG. 344.—Lemon tree inoculated by inserting bit of grey fungus (*Botrytis*) into the bark March 8, 1912. Photographed July 13, 1912. (Original).

FIG. 345.—Same tree as in Fig. 344. Photographed May 10, 1913, nearly 11 months later, showing by chalk lines the area of infected bark. A large part of the gum had been dissolved by spring rains. (Original.)

Grey Fungus (Botrytis) Gummosis.

After the rains of March, 1912, attention was called to the grey fungus (*Botrytis*) growing abundantly on the dead bark of gumming lemon trunks at Santa Paula, especially where neat's-foot oil had been used.

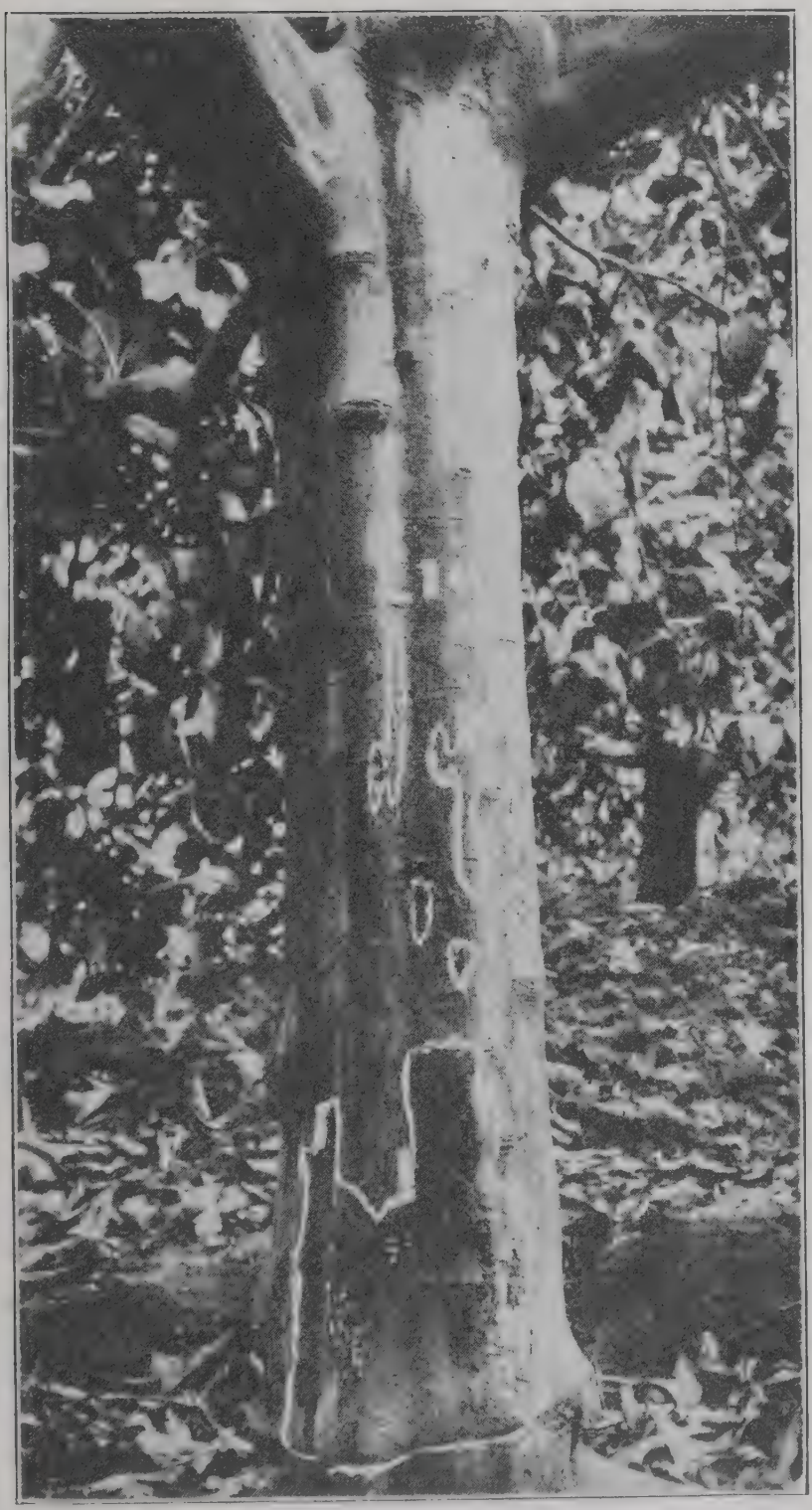

FIG. 346.—Lemon tree inoculated by inserting the grey fungus (*Botrytis*) into healthy bark, March 8, 1912. Photographed February 22, 1913, showing area of killed bark outlined with chalk. (Original.)

FIG. 347.—Same tree as shown in Fig. 346. Photographed May 10, 1913, to show the spread of the diseased areas. (Original.)

On March 8, 1912, inoculations were made with this fungus, taken directly from the bark and inserted into cuts in healthy trees. Pure cultures were obtained from these diseased trees and used in later inoculations.[1]

Figure 344 illustrates the result of an inoculation into the bark of a healthy tree with grey fungus (*Botrytis*), which had been taken directly from diseased bark. The inoculation was made March 8, 1912. The tree was photographed to illustrate the stage of the disease on July 13th. Figure 345 shows the area of killed bark, outlined by a white mark, on May 10, 1913, about one year and two months after inoculation.

The bark of the tree shown in Figures 346 and 347 was also inoculated with *Botrytis* fungus at the same time as Figure 344. It had begun to gum by June 15th. It had gummed copiously during the summer of 1912, an area of bark six inches long and five inches wide being killed by November. A ridge of gum five inches long and one and one half inches wide had formed on the killed area at that time. The disease appeared to be dormant during the fall, no new gum being formed, but it began to spread again later.

Figure 346 shows the outline of the diseased area of bark on February 22, 1913, and Figure 347 on May 10, 1913, showing how the areas of infection have merged. A cut in the bark without inserting fungus on the opposite side of this same tree has healed perfectly. A number of other inoculations with the same fungus at the same time developed similarly, while cuts in the opposite side of the same trees without fungus healed perfectly.

A few months later inoculations were made into the bark of healthy trees with pure cultures of the grey fungus (*Botrytis*) which had been isolated from the diseased bark of gummosis trees.[2] The same type of gummosis developed from these inoculations made with pure cultures under careful control as had previously developed under less careful conditions, but all kinds of injuries when kept sterile healed rapidly without gumming. The outer part of the bark in inoculations with *Botrytis* was killed first over large areas, the cambium remaining active and alive for some time. When the fungus became quite active, especially during moist weather, the bark softened and died to the wool, and the fungus produced raised cushion-like patches of grey spore-covered bodies on the surface. In dry weather there was usually no visible evidence of fungus.

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[1]In May, 1911, of the previous year Mr. R. S. Vaile and Mr. J. D. Culbertson had inserted under the bark of healthy trees, bits of diseased bark showing a growth of grey fungus upon it. Mr. Vaile's notes show that of five inoculations all produced some gum in from three to six weeks, and that the fungus had developed most rapidly on bark covered with neat's-foot oil.

[2]It was a problem how to make inoculations or injuries into tree trunks in the open and keep them free from organisms that might get in from the air or dust. In attempting to overcome this difficulty the following method was adopted for the most important of these inoculations: A cloth hood to be tied to the tree trunk was made by fastening a piece of fumigated tent cloth to a wooden barrel hoop cut open on one side. Strings were fastened to the cut ends of the hoop and to the corners of the cloth opposite the hoop. The strings opposite the hoop were tied to the trunk of the tree just below the branches and the hoop fastened below in such a way that it caused the cloth to flare out and leave a place underneath protected from falling dust and excessive currents of air. To settle the dust in dry weather the under surface of the hood, the trunk of the tree and the soil about the base was sprayed with water. The area of bark to be experimented on was then washed first with water, then with alcohol and quickly flamed with an alcohol lamp. The instruments used were either sterilized by heat or by alcohol which had been allowed to evaporate from their surfaces. Some of the inoculations were protected by wax, some with oiled paper waxed about the edges, and others with sterile microscopic glass slides held on with putty.

FIG. 348.—Lemon tree pounded with a hammer and infected with grey fungus (*Botrytis*) July 11, 1912. Photographed May 10, 1913, showing areas of diseased bark outlined with chalk marks. A pocket of gum near the top had formed under the live bark and is indicated by the dark line of exuding gum. (Original.)

Figure 348 shows a lemon trunk that had been injured by a blow from a crate hammer and then inoculated with spores of *Botrytis* and immediately waxed over. A spot on the opposite side of this tree was cleansed and pounded as on the side shown in Figure 348, and immediately waxed over without inoculation. This was done July 11, 1912. The hammer wound without fungus healed up without gumming. The inoculated wound shown in Figure 348 was gumming slightly August 22d, and copiously by September 24th. In the fall and winter it had stopped gumming, and the area of killed bark remained small until the spring of 1913, when it began to enlarge rapidly. The illustration (Figure 348), showing the area of killed outer bark outlined with chalk, was taken May 10, 1913, ten months after inoculation. A recent examination of this bark showed that the greater part of the inner bark and cambium was still alive under this killed area, and all but a few inches of it will probably be saved by the method of treatment described later, and illustrated by Figures 350 and 351. The application of pure neat's-foot oil to injuries or cuts in the bark that had been purposely infected with spores of the *Botrytis* fungus encouraged rather than hindered the growth and development of the fungus. Neat's-foot oil applied to sound pieces of bark placed in moist jars caused the *Botrytis* fungus to grow in two weeks five times as fast as on bark without the oil.

Brown Rot (Pythiacystis) Gummosis.

In September, 1913, a fungus was isolated from another type of gummosis at Whittier and inserted into the bark of trees at Santa Paula in November. This has produced a form of gummosis which is, in all respects, the same as that from which the fungus was isolated, and is probably the most common form of gummosis in California. The bark remains hard from the beginning, and is killed slowly all the way in to the wood, without there being the least evidence to the unaided eye or even through the hand lens of any fungus growth.

Figure 349 illustrates by the different lines of chalk marks the progress of the dying tissue from time to time. This tree was inoculated November 23, 1912. The smallest outlined area represents the killed area on February 12th, the next larger on March 14th, and the largest area on May 6, 1913. The bark was cut off at the time this was taken, May 6, 1913, to examine the condition underneath, and pure cultures of the brown rot fungus were obtained from this bark. It was found that in this case the killing of the inner bark lagged only a little behind that of the outer bark and the bark was hard over the entire area. These points appear to distinguish the brown rot (*Pythiacystis*) gummosis from that due to the grey fungus (*Botrytis*). Many other inoculations had been made with cultures from brown rot infected lemons and with bits of the infected lemons and typical cases of this form of gummosis have resulted in every case. Clean cuts not inoculated made in the opposite side of the same trees have healed up in the normal way without exception. Cultures isolated from diseased bark and put in contact with healthy lemons have produced brown rot, and cultures isolated from brown rot lemons and put into the bark have produced in every case this form of gummosis. Pure cultures of the brown rot fungus (*Pythiacystis citrophthora*) have been isolated from gummosis bark

from as widely separated localities as Chula Vista, in San Diego County; Whittier, in Los Angeles County; Santa Paula, in Ventura County, and Lindsay, in Tulare County, and all these have, on being inoculated into healthy trees, produced the same form of gummosis. Cultures of the brown rot fungus have also been reisolated from the inner bark corresponding to the outer white line in Figure 349, and this has been done from several other trees that had been inoculated. These reisolated cultures have been placed again on lemon fruits and have given them brown

FIG. 349.—Lemon tree inoculated with pure culture of the Brown Rot fungus (*Pythiacystis*) November 23, 1912. Photographed May 6, 1913. The two narrow black lines to the right are due to tar, not gum, running down from a limb above. (Original.)

rot. Neat's-foot oil applied to the surface of lemon bark and lemon fruits appeared neither to hinder nor to encourage the development and infection of the *Pythiacystis* or brown rot fungus mycelium that had been placed upon their surfaces.

It is well known that the brown rot fungus lives in the soil, and that wet weather and abundant rains encourage its growth. This would seem to explain why flooding the trunk of the tree with water or allowing the bud union to get below the soil would produce conditions favorable to infection of the lemon tree trunk, and bring on this type of

gummosis. The results of inoculations with the grey fungus, into the bark of lemon, sweet orange and sour orange trees, appear to show that the lemon is affected readily, the sweet orange much less readily, and the sour orange scarcely at all. This appears to furnish an explanation for the well known fact that sour orange trees are the least of all subject to gummosis under unfavorable orchard conditions, the sweet orange trees next and the lemon trees most of all. This may possibly be one explanation why lemons can not well be grown on their own roots in California.

Treatment of Gummosis.

Experiments discussed: Having found that two forms of lemon gummosis were infectious and that the causative agents were fungi, experiments were begun in co-operation with several of the lemon growers, not only to prevent the infection, but to find means of remedying those trees already infected. The requirements of a mixture to be used for this purpose seemed to us to be effectiveness in killing out the fungi, lasting qualities, inexpensiveness, and lack of injurious effect on the bark. The concentrated Bordeaux mixture was one of the most effective fungicides known, had lasting qualities that scarcely any other fungicide had, was inexpensive, and had been known to give good results when used for the treatment of similar troubles in Florida. Bordeaux mixture paste at various strengths, as well as a number of other fungicides, were tried out by the Limoneira Ranch. Bordeaux paste was also used by the San Diego Fruit Company at about the same time.* The experiments with the Bordeaux paste, which were begun over a year ago, appear to show that it is the most promising of any preparation yet tried. These investigations are yet in an experimental stage, and other growers may find something just as good. It seems certain, however, that the Bordeaux paste will prevent infection from these fungi when applied to bark not yet infected, and will kill out any of the fungus it is allowed to come in contact with, and will last a long time. So far the mixture has shown no injurious effect on the bark. It should be kept in mind that small patches of bark may be infected and have the fungus in them when there is yet no evidence of gum on the surface, and gum may exude after applying the mixture. Results from treatment of trees already diseased must not be expected too soon. The inoculation experiments before described show that the fungus may at times be in the bark for over a year before large areas are finally killed, and it will probably take as long, or longer, to work out all the infection.

Applying the Bordeaux paste: It seems from our present knowledge that the bark that is dead to the wood should be removed before applying the paste, in order to allow the mixture to kill out the infection. In grey fungus gummosis the outer bark is often infected and dead over large areas while the inner bark with cambium is still alive. In this case the outer dead part may be scraped off with a curved sharp tool made by a blacksmith on purpose for this work, leaving the inner part of the bark still attached (Figure 350). The idea of scraping the outer bark was conceived by Mr. J. D. Culbertson, and the instruments

*Only recently the writer has learned of three or four other growers having used a similar mixture each independently of the knowledge of the other, two years or more, for gummosis and scaly bark with good results in all cases.

shown in Figures 350 and 351 were developed by him at the Limoneira Ranch.

On trees treated on the Limoneira Ranch nearly a year ago by this

FIG. 350.—Tree affected with the *Botrytis* form of gummosis being scraped. (Original.)

method, the bark is healing well under the Bordeaux. The outer bark should be scraped an inch or so beyond the line of visible infection and the entire trunk painted with the paste (Figure 351). In the brown

rot gummosis, which is probably the most common and most widely distributed of the two on lemon trees in California, it will probably be well to cut out or trim out the bark an inch or so beyond the discolored

FIG. 351.—Lemon tree affected with gummosis, scraped and being painted with Bordeaux paste.

line before applying the mixture. If this is done when the area of killed bark is small the infection may be stopped readily. Mr. J. A. Prizer of the San Diego Fruit Company has had good success with this method.

In trimming out this bark he uses a farrier's knife such as is used in trimming horses' hoofs. Where the killed areas of bark are so large that all the diseased bark can not well be taken off, two slits are made up the trunk, one on each side of the infection, for the purpose of confining it to one section of the trunk. Another cut is made to allow the gum to drain out. The entire surface is then covered with the Bordeaux paste. Just how much bark it is necessary to take out and whether slitting is necessary are questions that need to be further investigated. It seems advisable with our present knowledge to cut the branches back more or less severely on the side where the bark has been killed over a very large area. If the area is small, no cutting back need be done. If the bark is allowed to become entirely dead the greater part of the way around, it is then usually a waste of time to try to save it. One must expect the gum to run out freely for several weeks after treatment, even while healing is going on. One should watch for the formation of new healthy tissue rather than the amount of gum that is exuded after treatment. The gum that has already formed under the bark beyond where any fungus is found will drain out. The gum itself, as has been shown by inoculation, usually does not contain any infectious principle. The infectious principle (the fungus) is in the diseased bark or wood at the junction of the live and dead tissue. The formula that is being recommended as a result of a number of experiments by growers is as follows:

Bordeaux Paste.

1 pound of bluestone (copper sulphate) dissolved in 1 gallon of water in a wooden or earthen vessel. This can best be done by hanging it in a sack in the top of the water.

2 pounds of unslaked lime, slaked in about one half gallon of water. Some variation from these proportions may be made without greatly changing the value of the paste.

Stir together when cool, making a light blue mixture about the consistency of whitewash. If the mixture turns to some other color before being applied, it is an indication that something is wrong. Mix up fresh each day or two, as the mixed paste tends to deteriorate with age. It may be applied with a large brush as whitewash. (Figure 351). A wash made of equal parts of lime and sulphur (self boiled) is also being tried out. This may prove equally as good. Many other fungicides are being tried.

Summary.

Lemon gummosis in at least two forms has been found to be readily transmissible from diseased to healthy trees by inoculation.

By series of many inoculations into healthy trees it has been found that the grey fungus (*Botrytis vulgaris*) is capable of inducing one form of gummosis, and that the brown rot fungus (*Pythiacystis citrophthora*) is capable of inducing the other.

Both these fungi have been isolated from trees affected with gummosis, and after inducing gummosis in healthy trees have been reisolated from these inoculated trees. These fungi were found to be at the

advancing margins of diseased areas in the bark and wood, and were not found in the exuded gum nor in the tissue already thoroughly permeated with gum.

The grey fungus (*Botrytis*) gummosis is characterized by a killing of the outer layer of bark much in advance of the inner, and by a softening of the bark and production of spores in moist weather, where the bark is entirely killed to the wood.

The brown rot (*Pythiacystis*) gummosis is characterized by a killing of the bark to the wood as the area of infection advances, without outward evidence of fungus at any time, the bark remaining hard during all stages of the disease.

The concentrated Bordeaux mixture or Bordeaux paste in about the proportion of 1 pound of bluestone, 2 pounds unslaked lime to about 1½ gallons of water has given promising results in the treatment of these two forms of gummosis, providing the diseased areas were properly prepared before its application.

SOME FIELD NOTES ON A SOFT GRAY SCALE KNOWN LOCALLY AS THE "LONGULUS" SCALE.

By Delacourt Kell, County Horticultural Inspector, Pomona and Claremont district.

This scale is somewhat prevalent in my district, and hitherto has been very little affected by fumigation with hydrocyanic acid gas carried out at the time at which the best results can be looked for on the black scale.

The following notes, containing the experimental fumigation undertaken to determine at what season, if any, this scale could be killed, may therefore be of interest to those who have it in their groves and are fumigating this year. I believe Mr. R. S. Woglum is conducting some fumigation experiments for it on a larger scale, which should give us more reliable results, but meanwhile the following may be of some use.

Some of the notes are taken from my article in the Pomona College Journal of Entomology for November, 1912.

I believe the species of this scale has not yet been officially determined. It is known in my district as the "longulus" scale. It occurs also in other parts of this State.

This scale is somewhat similar to the soft brown scale (*Coccus hesperidum*) but is grayer, less shiny and the young are more transparent and lie flatter to the leaf, appearing to adhere closely to it as a mere film. The ants do not foster it to the same extent as they do *Coccus hesperidum*.

The scale is practically viviparous, though eggs can occasionally be found along with the live young under the old shells. The hatch appears to be fairly regular, extending from about May 1st to August 21st, in the two years I have had it under observation. Mr. Roy Campbell, who is working on the life history of this scale, tells me that he has counted as many as 500 young from one scale.

The adult scales vary much in size, giving the appearance of an uneven hatch, but one finds the quite small ones bringing forth young at the same time as those that are perhaps six times their size. The biggest are larger than the largest soft brown scale.

Soon after hatching begins the surface of the mother scales becomes dry and light brown in color, and begins to adhere less closely to the twig. At this stage they are found almost wholly on the smaller twigs, being arranged in places in an imbricated manner, covering the twig-like fish-scales. When the young are all out, the dead shells are very apt to drop off, leaving whitish marks. One does not find many old shells of the preceding year, as is the case with the black scale.

This scale throws out a great deal of honeydew, the resulting smut making the trees very dirty, but this takes place somewhat later in the season than is the case with the black scale, so that the navel oranges have usually been picked; but the Valencias become much soiled.

With regard to the following experiments, in all cases the trees selected were the most badly infested that could be found of a suitable size. Sodium cyanide and the Woglum system were used.

As regards the condition of the scale when fumigated, young were still being produced under the old shells up to August 21st. On trees fumigated before that date apparently all the young under the shells at time of fumigation were killed, but the old mother-shells were not affected, so that a few young would be born after fumigation at any date prior to August 21st.

On or about July 1st, this year, I took a count, on each tree, of the adult scale that I could find in a ten-minutes' search. The number of adults that could be counted in the same time on a neighboring tree was also taken as a check and indication of the condition of the other trees in the same grove. But on the trees fumigated the number found in ten minutes would be about all the adults that were on the tree, whereas on the other trees this was by no means the case.

The results are not quite uniform, and the number of trees treated was not large, but I think the results may be held to indicate that there is a good chance of obtaining a fair killing on this scale between, say, July 20th and end of August. Between these dates there does not seem to be any marked difference in results. With regard to dosage, it seems to be that a three-quarters schedule would be advisable, to give a safe margin, while a heavier dosage than that does not seem to be justified.

With regard to the work of the contractors last fall, all the fumigations done after the middle of September were failures as far as the "longulus" is concerned. One grove fumigated on September 7th with an "estimated" schedule was also a bad failure, but in this case a very poor result was also obtained on the black scale. In one grove a very good result, both on the black and "longulus," was obtained on September 13th, but the same outfit got very poor results on "longulus" in another grove, close by, on September 17th, though they again got a good killing on the black. In both cases a five-eighths schedule was used. In another grove, where we got a very satisfactory result on "longulus" on September 4th on the six trees we fumigated, the contractor got a very poor result on it over the rest of the grove when it was fumigated only twelve days later, September 16th, using a five-eighths schedule, though he killed the black very well.

I may mention that all of the 57 trees fumigated experimentally are now fairly free from black scale as well as "longulus," though in some of these groves there is much black scale on the surrounding trees. This

would go to show that the specially early fumigation necessary for the "longulus" may be looked for to also give a useful result on the black.

The experimental fumigation was done by Mr. C. H. Vary and myself in 1911, and by Mr. J. W. Mashmeyer, Mr. H. H. Schaper and myself in 1912, Mr. Schaper also supplying the outfit free of charge.

RESULTS OF EXPERIMENTAL FUMIGATION FOR "LONGULUS" SCALE.

Date	Grove	No. of trees	Schedule and number of minutes; number of scale counted in 10 minutes on July 1, 1913							Check tree, fumigated by contractor.		
			1/2 twice 30 & 45	1/1 60	3/4 60	3/4 45	5/8 45	1/2 45	1/2 30	Date	Schedule	Scale counted, July 1, 1913
1911.												
Aug. 28	I	1	-------	23	-------	-------	-------	-------	-------	12/16/11	1/1	520
Oct. 9	I	4	10	-------	-------	4	-------	14	-------			
			12	-------	-------	-------	-------	-------	-------			
1912.												
July 23	III	5	-------	-------	-------	10	16	14	-------	12/6/11	1/1 & 1 1/2	500
							22	26	-------			
July 25	IV	5	0	-------	3	0	-------	-------	-------	1/25/12	7/8	156
			0									
			1	-------	-------	-------	-------	-------	-------			
July 27	V	6	2	-------	3	2	0	18	-------	12/8/11	1/1	300
			1									
Aug. 12	VI	6	22	-------	33	33	36	43	-------	11/2/11	1/1	230
			7									
Aug. 13	VII	6	3	0	-------	1	8	2	4	10/17/11	1/1	143
Aug. 14	VIII	6	6	6	-------	5	11	44	4	11/17/11	1/1	900
Sept. 2	IX	6	36	1	-------	1	11	8	11	11/19/12	5/8	320
Sept. 3	I	6	3	2	-------	10	12	25	90	12/13/11	1/1	1000
										12/10/12	?	
Sept. 4	II	6	0	1	-------	0	1	6	10	9/16/12	5/8	470
Average counts		57	6.75	2	13	7	13	21	24			

A BILLBUG INJURIOUS TO SMALL GRAIN.

(*Sphenophorus discolor* Mann.)

Order—Coleoptera. Family—Calandridæ.

By Harry S. Smith, Superintendent, State Insectary, Sacramento, Cal.

Species of the genus *Sphenophorus* are frequently found to be serious pests in some parts of the United States, but in California they rarely attract attention. These insects, more commonly known as "billbugs," at times cause a very considerable injury to corn and sugar cane, but their attack on small grains is of much less common occurrence. For these reasons the following observations on *Sphenophorus discolor* Mann.* are deemed worthy of recording.

Attention was called to the injury of small grain by this *Sphenophorous* on May 22d by Mr. Eichoff, Assistant Agriculturist of the West Sacramento Company. Specimens of the beetle were brought to the Insectary. Mr. Eichoff was accompanied to the experimental plats where some grains were being grown, and the beetle was found to be doing a considerable amount of damage to all varieties of barley, wheat and oats. The injury was particularly conspicuous, as the heads of all plants affected had turned white and the kernels had failed to develop. On examination it was found that the beetles inserted their

*Determined by Dr. E. A. Schwarz, Bureau of Entomology, through the kindness of Mr. W. D. Pierce.

FIG. 352.—*Sphenophorus discolor* Mann., enlarged about one and one-half times. (Photo by Essig.)

FIG. 353.—Barley stem showing slit made by proboscis of *Sphenophorus discolor* Mann., also leaf showing punctures. (Photo by Essig.)

probosces through that part of the stem known as the boot. The main stalk bearing the head was then entirely severed, this of course ruining the plant for all but forage purposes. The beetle was found commonly at work in the fields, clinging to the stalk of grain, usually with the head downward.

The surrounding country is mostly covered with a heavy growth of the common tule or bull rush (*Spirpus lacustris*), and the ground upon which affected grain was growing was but recently reclaimed from this sort of land. There seems to be but little doubt that the billbug breeds in the roots of these tules. Their great size would preclude their breeding in many of the smaller grasses in which the *Sphenophorus* develop. However, no larvæ or pupæ were discovered. It is probable that this insect will prove to be injurious only during the first year that grain is grown on tule land. The destruction of the rushes would leave no breeding place, and in consequence the billbugs would disappear in a short time.

THE CODLING MOTH.

(*Carpocapsa pomonella* Linn.)

Order—Lepidoptera. Family—Tortricidæ.

By Geo. P. Weldon, Chief Deputy Commissioner of Horticulture, Sacramento, Cal.

Wormy apples and pears are of more common occurrence this season than usual in sections of the State where pome fruits are grown. Probably the codling moth is no more abundant than it is other seasons, but there is such a small crop of fruit in a majority of the orchards that a much higher percentage of it is wormy.

During seasons of light crops the codling moth is generally very difficult to control, simply because there are just as many of the moths to start with and only a relatively small number of apples or pears for their progeny to feed upon. If there are several larvæ trying to feed upon the same apple, the chances are that one or more of them will be successful in entering at a point unprotected by spray. The large number of these fruits, wormy in the calyx end, indicates that the calyx application, the most important of all in controlling codling moth, was not made thoroughly or not at the proper time. This application must be made before the calyx cups close, which will be scarcely more than a week after the petals fall in the case of apples and a much longer time with pears. Indeed, some varieties of the latter never close the calyx entirely, and there would seem to be no excuse for not protecting the fruit from the entrance of worms at that point. A carefully sprayed orchard, if the spraying were done at the proper time to protect the calyx, should have practically no fruit wormy in the blossom end. Arsenate of lead, or any other good arsenical spray placed in the calyx, will, in the case of the apple at least, remain there and kill practically all worms which try to enter that way throughout the entire season.

THE MANZANITA SERICA.

(*Serica anthracina* Lec.)

Order—Coleoptera. Family—Scarabæidæ.

By E. O. Essig, Secretary State Commission of Horticulture, Sacramento, Cal.

In the latter part of April this office received a communication from Mr. J. E. Hassler, County Horticultural Commissioner of El Dorado County, stating that a certain fruit orchard in the foothills near Placerville was being defoliated by a mysterious foe, the presence of which could neither be found nor accounted for. He also stated that two years ago the attention of this office was called to this condition, and that the secretary of the Commission spent a day in the orchard, but was unable to locate the trouble. At the request of Mr. Hassler the writer went to Placerville with the idea of ascertaining, if possible, the depredator, and to suggest means of control. On May 20th Mr. Hassler took the writer to the orchard, and the damage to the trees, especially prune and apple, proved serious. Practically all of the leaves were removed to the stem. This work had continued for over a month, and some of the trees had been killed during the past year because of the constant and complete defoliation.

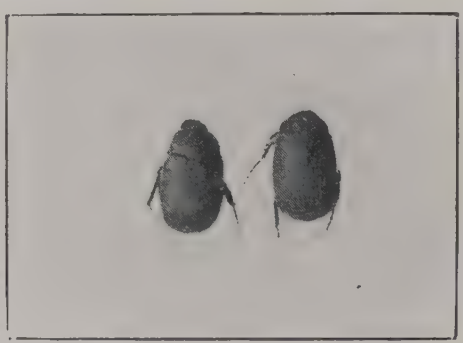

FIG. 354.—Adult specimen of the manzanita serica, *Serica anthracina* Lec. Natural size. (Original.)

At first sight the work appeared to the writer to be that of the scarabæid beetles, and after two or three hours of diligent search a single specimen was found actually eating the leaves of a prune tree. This was followed up, and before we left we were able to find a dozen actually doing the work; so that we had discovered, beyond doubt, the pest.

Inasmuch as the principal damage was done to trees around the edges of the orchard, the writer was led to believe that the beetle found was of native origin and would probably occur on the wild shrubbery adjoining the orchard. This supposition was confirmed immediately by finding the same beetle abundant on the manzanita and producing exactly the same injury to this shrub as to the orchard trees. Great numbers were found feeding upon this plant around the entire orchard. It was also found feeding in less numbers upon the black oak, lupines and upon *Ceanothus* sp.

The least touch to the host plant would cause the beetles to drop immediately to the ground and secrete themselves under any hiding

place. Even if the beetles saw one approaching they would drop to the ground. This probably accounts for their not being discovered sooner. The beetle, Figure 354, varies from a light brown to almost black in color and is less than half an inch in length.

Apparently this insect is most abundant in the foothill section of the Sierra Nevada mountains, having been reported about Bowman, Placer County, California; Nevada City, Nevada County, California; Placerville, El Dorado County, California, and Inyo County, California, but it has also been reported to occur in Fresno County, where it attacks the foliage of the plum. It is probable that this insect was driven to the orchard trees due to the shortage of green wild shrubs because of the dry year, and that it will never be a serious pest except under these conditions.

The best remedy is the application of a lead arsenate spray prepared as follows: 8 pounds lead arsenate, 8 pounds lime to 100 gallons of water. The lime acts somewhat as a repellant. This spray should be applied as soon as the beetles appear in the spring, and the tender tips and twigs drenched liberally. Repeated applications will be necessary to thoroughly protect the trees.

The writer is indebted to Mr. Charles Fuchs, of the California Academy of Sciences, for the identification of this insect.

GENERAL NOTES.

THE PRUNE APHIS.

(*Aphis prunifoliæ* Fitch.)

The appearance of this aphid was recorded on page 569, volume II of The Monthly Bulletin in June, 1913. Since this record the aphid has been reported from many prune-growing sections of the Sacramento Valley and has caused alarm and worry to some of the orchardists. The louse is light green in color, and is covered with a rather thick coating of fine white powder, which at once distinguishes it from all other lice attacking the prune. It attacks the tips of the twigs and collects in

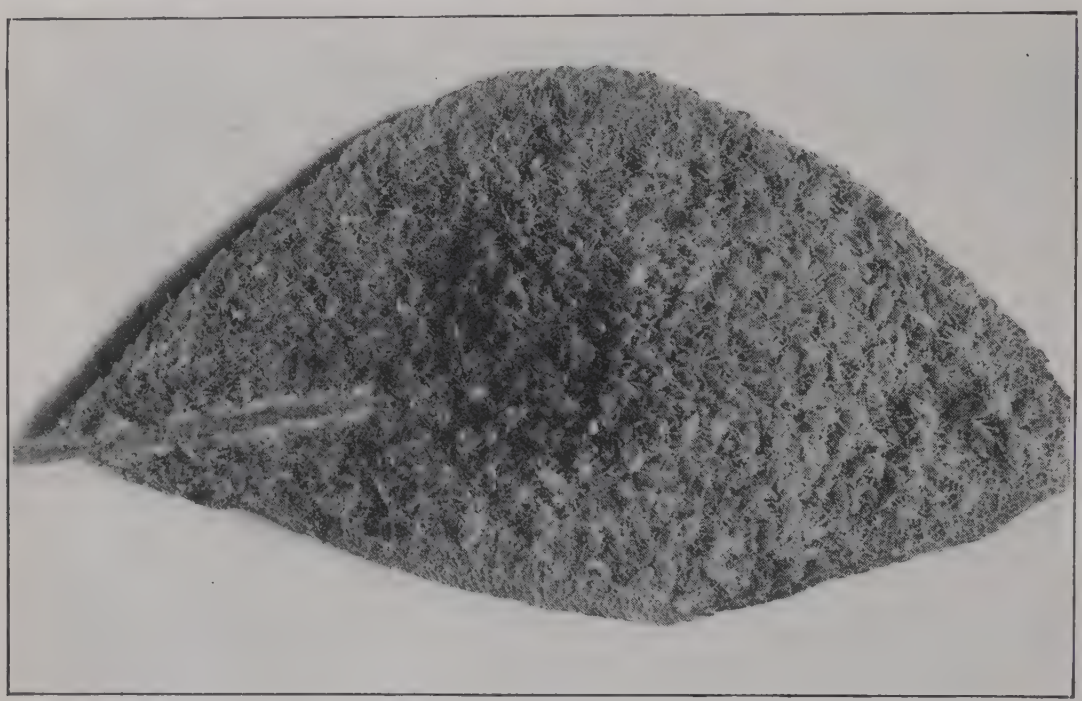

FIG. 355.—Prune leaf covered with the prune aphis, *Aphis prunifoliæ* Fitch. Slightly enlarged. (Original.)

exceedingly large colonies, especially upon the under sides of leaves which are slightly curled by their work. Figure 355 shows the actual conditions on a single prune leaf taken from the Yolo orchard in Yolo County on May 10, 1913. At that time the presence of the larvæ of syrphid flies and internal hymenopterous parasites were in sufficient numbers to indicate that the pest would be subdued before it did any great amount of damage. In a few sections, however, control measures were found necessary, which consisted of the application of a tobacco spray composed of nicotine sulphate in the proportions of 1 to 1500. A coarse driven spray under high pressure is necessary to force the liquid through the powdery waxy coating secreted by the insect.—E. O. ESSIG.

HORTICULTURAL PRODUCTS FROM JAPAN.

Working under a well defined policy of permanent progress in every phase of the service, and with particular reference to horticultural material intended for exhibition at the Panama-Pacific International Exposition, the executive head of the quarantine division at San Francisco and the Japanese Consulate at that port have been co-operating for some time in an effort to improve the condition of trees and plants imported into California and the United States in general from the nurseries of Japan. The equity of each phase of the situation has been thoroughly discussed, and articles dealing with the practical methods employed in California to keep nursery stock clean of insect pests and in which the salient points that make for success in fumigation were clearly portrayed and strongly emphasized, have been prepared and furnished to the Consulate. These translated into Japanese were forwarded to the officials in Japan, together with specimens *in situ* of thirty different insect pests taken from material found on imports from that country by the quarantine inspectors at San Francisco during the past season.

The quarantine office at San Francisco is in receipt of information from the Consulate that in conformity with the regulations of the Plant Quarantine Act the Government of Japan has established a quarantine service for the inspection and control of plants intended for exportation, with officers and stations at Tokyo, Yokohama and Kobe. This is decided progress, and its results will eventually be far reaching.—Frederick Maskew.

BLACK TREE PROTECTORS TO PREVENT RODENT INJURY SHOULD NOT BE USED.

Often it becomes necessary to protect the trunks of young trees in some way or other to keep rabbits and other rodents from barking them. For this purpose various kinds of shields have been used with success.

The writer recently examined some two-year-old olive trees in an orchard near Madera, where heavy, black paper shields were being used in this work. It was claimed at the time that they were put on, which was during the previous season, that the fact that they were black would not make them liable to damage the trees, this tendency having been overcome by perforations in the paper. While this might be a good selling point for these shields, in actual tests it did not prove sufficient to prevent severe sun-scald on the south side of trees. My visit to the orchard had been preceded by several days of very hot weather; many trees had recently died and many more were scalded on the south side of the trunks. Every tree examined showed more or less of this injury, even though the tops appeared perfectly normal.

While the use of protectors is good both in keeping off rodents and preventing sun-scald in some cases, a black protector should not be used during the hot season at least. Light colored wooden or paper protectors will serve the purpose for which they are intended just as well and will not endanger the lives of the trees from scald during the hot weather.—Geo. P. Weldon.

WHAT OF INTRODUCED PARASITES?

The passage of Dr. F. Silvestri through San Francisco on June 19, 1913, with a splendid collection of living specimens of several species of fruit fly parasites, awakened a new interest in the possibilities of this rational method of controlling imported insect pests, and brought forcibly to the mind of the writer the many shipments of similar live active collaborators sent by him to California in years past, and at the same time a vivid remembrance of the manner in which the same were treated after arrival.

In view of the publicity given to Dr. Silvestri's well earned success and as an incentive to further work along these lines, the following suggestions are offered. That an investigation be made of the causes—

Why the grasshoppers have never been epidemic in the Livermore Valley since the fifty-nine living specimens of locust parasites were liberated in that locality by the late Alexander Craw on June 11, 1900, the same having been sent to him by the writer from New South Wales, Australia?

Why no more complaints are heard from the Fresno County grape growers about the mealy bug pest since the writer liberated the small Philippine ladybugs in the vineyard of the Backer Vineyard Company three years ago?

What has become of the Pulvinaria pest in the apple orchards at and around Downey in Los Angeles County since Frederick Maskew liberated the Hymenopterous parasites in those same orchards which had been obtained from one of the eastern states?—Geo. Compere.

INSECTARY SUPERINTENDENT TO COLLECT IN ORIENT.

Mr. Harry S. Smith sailed on the 5th of August for the Orient, where he goes to seek valuable beneficial insects. Owing to lack of funds, no other will engage in the service this year. Some time since, Mr. Smith discovered in Europe some seven parasites or predaceous insects on the alfalfa beetle, which he transported and introduced in the alfalfa fields of Utah. We have great reason to hope for rich results in this present undertaking. He will be absent two or three months.—A. J. Cook.

LADYBIRD BEETLES SENT OUT.

The State Insectary has collected and distributed 75,000,000 of the ladybird beetles *Hippodamia convergens* this year, as against 43,000,000 last year.—A. J. Cook.

THE DESTRUCTIVE ELEODES.

(*Eleodes omissa* var. *borealis* Blaisd.)

During the month of May, Mr. K. S. Knowlton, County Horticultural Commissioner of Kern County, sent specimens of a tenebrionid beetle, which he reported as doing much damage to orange trees around Bakersfield. Later he also sent specimens to the writer. On June 9, 1913, Mr. E. F. Siegfried of Wasco, Kern County, wrote that a black beetle had stripped quite a number of apricots and plum trees in his orchard. He reported that they were so thick as to entirely cover the ground.

FIG. 356.—The destructive eleodes, *Eleodes omissa* var. *borealis* Blaisd. Collected at the base of an apricot tree. (Photo by E. F. Siegfried.)

Figure 356 was taken by Mr. Siegfried, and shows the beetle at the base of an apricot tree. Watermelon vines are also severely injured by this beetle.

Poison bran did not seem to offer a ready means of control, inasmuch as the insects preferred plant food. Poison sprays strongly applied are not as effective against this beetle as against some other insects, due to its highly resistive powers.

Its occurrence in such numbers is probably due to the dry season, which was apparently very favorable to breeding.—E. O. ESSIG.

MONTHLY CROP REPORT—JULY.

These data are compiled by the secretary from monthly crop reports made by the county horticultural commissioners. Counties not included have not reported or the reports have come too late for press. Unless otherwise designated, percentages refer to last year's crop.

The crop report of this month has been materially changed throughout the State due to the excessive dry weather and hot winds which have prevailed. Some sections were not injured as much as others, but there is hardly a location which has not suffered. These conditions, together with the late frosts, will make a considerable shortage in a number of crops.

Alfalfa.

The reports relative to the alfalfa crop are very encouraging, and with the exception of a single locality the crop will average from 90 to 100 per cent of that of last year. In most localities there will be as much alfalfa produced as was produced last year.

Almonds.

The almond crop is exceedingly spotted throughout the State. While some counties, notably Alameda, Madera and Riverside, report a slight decrease over the report of last month, other counties, including Butte and Monterey, report a slight increase. In only a few localities will there be a full crop, while in others the range varies from 10 to 90 per cent, the average being from 50 to 85 per cent. The excessively dry weather is responsible for a slight reduction over last month's estimate in the localities noted.

Apples.

The apple crop will be decidedly short, due, as in the case of many other fruits, to the dry weather. There are no reports of an increase over that of last month, with the exception of a slight increase in some of the northern counties. The largest producing sections, including Monterey, Santa Cruz, Lake, Mendocino, El Dorado and Nevada, will produce less than half a crop, the average being from 25 to 30 per cent. Sonoma County reports a crop of 85 per cent of last year, which may be slightly decreased because of the dry weather. Humboldt reports 90 per cent of last year's crop, which was only 65 per cent of normal. Santa Cruz—20 per cent of last year's crop.

Apricots.

The conditions of the apricot crop over last month's report have changed only slightly, there being a slight increase in most localities. Throughout the State the crop was short, varying from 35 to 100 per cent of normal crop.

Beans.

The bean crop will be good throughout the State, varying from 70 to 100 per cent of full crop.

Beets (Sugar).

The sugar beet crop will be a little short, due to the dry weather. Only incomplete estimates have been made.

Berries.

Reports still show that there will be a good crop of berries throughout the State. The lack of moisture is especially reducing the strawberry crop.

Cherries.

Reports of the cherry crop have not materially changed from those of last month. Dry weather caused considerable of a reduction in the valley sections.

Grapes.

The grape crop in the Sacramento and San Joaquin valleys will be much shorter than was predicted, due to the hot, dry weather, which caused considerable sunburn. The burning was largely due to the defoliation of the vines by injurious insects, including grasshoppers in the central part and vine hoppers in the San Joaquin Valley. In many localities the crop will run as low as 50 per cent. The wine grapes will produce a better crop than either the raisin or table varieties.

(Raisin).

The raisin crop in Fresno County will be 70 per cent of normal. Kings County reports 90 per cent due to heat. Madera will have only 70 per cent, due to hot weather and vine-leaf hoppers. The water table in that county is seven feet lower than usual. All varieties in Orange County report a good crop. Solano County will have only 40 per cent of a crop because of sunburn. Yolo County reports a very short crop, ranging from 10 to 25 per cent, due to hot weather, which produced sunburn. Yuba County reports 70 per cent, due to similar weather conditions.

(Table).

Table grapes were seriously injured because of the hot weather, and in all sections the crop will be short, averaging from 75 to 90 per cent. San Joaquin—Pretty well cooked, especially where not irrigated. Tokays suffered most; some damaged 60 per cent.

Wine.

Wine grapes promise a fair crop, being reported from the various counties as follows: *Alameda*—70 per cent. *Butte*—100 per cent. *Fresno*—100 per cent. *Kings*—90 per cent. *Lake*—100 per cent. *Los Angeles*—100 per cent. *Madera*—85 per cent. *Napa*—80 per cent. *Orange*—150 per cent. *Riverside*—90 per cent. *Sacramento*—50 per cent. Sunburn and dry, hot winds are responsible for this shortage. *San Bernardino*—95 per cent. *Solano*—90 per cent. Regarding the crop in Sonoma, Mr. Gallaway writes: "Some varieties of grapes also were quite badly burned in places, but in spite of the excessive heat and grasshoppers, I am of the opinion that there will be more grapes produced in Sonoma County this year than last." In Santa Clara the former reports remain the same. In Yuba County and other sections of the Sacramento Valley the crop will average about 70 per cent, due to the hot winds.

Hay (Grain).

Only a few counties have reported relative to the conditions of this crop. The counties along the coast and in the interior and southern parts of this State will have from 50 to 70 per cent of a crop, while the foothill counties and the mountainous counties will have a good crop.

Hops.

The hop crop promises to be very good in spite of the hot weather. The following producing counties have reported: *Lake*—full crop. *Mendocino*—full crop. *Sacramento*—full crop. *Sonoma*—good crop. Mr. Gallaway writes that the growers seem to have been benefited in a way by the hot weather, as the hop lice, which were threatening their crop, have been almost eradicated. Yuba will produce but 60 per cent of a crop. Other localities have not reported.

Lemons.

The situation relative to the lemon crop has not greatly changed throughout the State. Butte County reports 15 per cent decrease under report of last month, while Orange County reports an increase of 10 per cent. Los Angeles County will have 15 per cent of normal crop instead of 10 per cent, as previously reported. In other sections the reports of last month still hold good.

Olives.

According to all reports, the olive crop will be much larger than that of last year. Butte County reports twice as much as last month. *Fresno*—50 per cent more. *Los Angeles*—5 per cent more. *Madera*—100 per cent more. *Sacramento*—5 per cent more. A few counties report a slight decrease under last month's estimates. Nearly all of the other localities report a full crop.

Oranges.

The condition of the orange crop in the south remains practically the same as first reported, with an increase of 40 per cent in Los Angeles County, and from 5 to 20 per cent in Orange County, which reports navels 100 per cent and valencias 75 per cent. Santa Barbara County reports navels 100 per cent of last year's crop. Butte County reports a decrease of 15 per cent, and Sacramento County a decrease of 5 per cent under last month. Mr. G. Harold Powell predicts a 65 per cent to 80 per cent crop of citrus fruits this year.

Peaches.

Reports concerning the peach crop are more favorable this month than last, there being a considerable increase. Alameda reports 25 per cent increase, and Orange a large increase, especially in drying varieties. The crop throughout the State ranges from 25 to 100 per cent, the average being about 75 per cent. *San Joaquin*—Muirs 80 per cent, Lovells 75 per cent, Elbertas 50 per cent.

Pears.

The reports relative to pear crop show a slight increase over that of last month. In the Sacramento Valley there has been a slight decrease due to the dry season. The range in the production compared with last year is from 25 to 100 per cent, the average being about 75 per cent. *San Joaquin*—a good crop, but in many instances undersized. *Tehama*—from 20 to 50 per cent of last year's crop.

Plums and Prunes.

There is a marked falling off in regard to the yield of these crops, a notable decrease being reported in nearly every locality. The crop ranges from 25 to 75 per cent, or an average of about 50 per cent. Hot winds injured the crop in Sonoma and Yolo counties, so that the former will be less than 10 to 15 per cent of last month's report. The crop in Yolo will be from 15 to 25 per cent. *Contra Costa*—50 per cent. *Tehama*—40 per cent. *Santa Clara*—Mr. Morris reports: "The prune orchards are showing the effects of the hot dry weather. Some fruit can not ripen properly, and some is dropping. The estimate must be lowered, but how much it is impossible for me to say with the slightest degree of accuracy."

Walnuts.

There is a slight increase in the estimate regarding the walnut crop, the southern counties reporting good yields. Orange County reports all varieties heavier loaded than last year, with a reduction of 5 per cent by blight. Santa Barbara reports 198 per cent of last year's crop. Contra Costa reports a crop of 20 per cent more than last year, which was but 60 per cent of normal.

Cotton.

Mr. Wilsie reports 25,000 acres of cotton in Imperial County looking good, with excellent prospects.

Cantaloupes.

The season is just over for the marketing of 6,100 acres of cantaloupes, which has been successful; the growers will realize about $150 per acre. The facts are not all in to make exact accounting.—W. E. Wilsie.

INSECT NOTES.

The rosy apple aphis, *Aphis sorbi* Kalt. This pest is found to be quite common, though serious only occasionally, this season. There is probably no other aphis that attacks the apple that can do as much mischief as this one. In places it is being kept in check quite well by natural enemies; in still others they are not sufficiently numerous to control it. This aphis not only affects the foliage, but the fruit as well, and in certain orchards visited much fruit has been seen that is ill-shapen, has made no growth and can not possibly mature. The leaves are rolled very tightly by this pest, and a spray for its control should be applied early in the season when its first appearance is noted. The tobacco preparation, known as Black Leaf "40," is one of the very best sprays to use in controlling it. About 1 part of the Black Leaf "40" to 800 to 900 parts of water and a little soap to make it spread and penetrate better is sufficient to kill.

The Oregon Experiment Station recommends a mixed spray of lime-sulphur and Black Leaf "40."—GEO. P. WELDON.

The peach twig-borer, *Anarsia lineatella* Zell. As early as July 4th at Hanford, Kings County, signs of the twig-borer constructing their little cells or hibernaculæ in the crotches of small peach trees were noticed. On July 16th at Hollister, San Benito County, many freshly made mounds of borings were seen in the crotches of peach trees in that section. Some of the hibernating cells were cut into and the larvæ found within. Again on July 18th at Hayward, Alameda County, a number of larvæ were found in hibernating cells in small crotches of apricot trees. The apricots in a fair-sized orchard showed considerable infestation, and it will probably be necessary to spray for its control another season. A spray of lime and sulphur, 1 part to 9 of water, if applied thoroughly during the dormant season will give almost perfect results.—GEO. P. WELDON.

The cherry slug, *Caliroa cerasi* Linn. The foliage of pear trees is being attacked by this pest in various parts of the State where this fruit is grown. An orchard in Alameda County, which was inspected on July 18th, was found to contain a great many eggs. The tree had been sprayed recently with Paris green and lime in order to control the codling moth. The spray answered a double purpose, for practically all of the cherry slugs were killed also. The eggs hatched well, and the spray could be seen on the leaves where the little larvæ had fed for a short time prior to getting a fatal dose of the poison. This pest is one of the easiest to control by means of an arsenical spray, and there is little excuse for the damage that we often see from its attack.—GEO. P. WELDON.

The mealy plum aphis, *Hyalopterus arundinis* Fab. This species of aphis is commonly found at this time on plum, prune and apricot trees. Ladybird beetles and other enemies are controlling it quite well in most cases. Its damage is probably over for the season. Another season should it become bad a nictotine spray should be used.—GEO. P. WELDON.

Jumping oak galls. A. G. Shulz, Horticultural Commissioner of Tulare County, has sent galls from oak trees which look like small eggs and are surprisingly active. They hop about in a most lively fashion. The cause is the larvæ of a cynipid gall fly, which are within the galls.—A. J. COOK.

A small blue and bronze chrysomelid beetle, *Colaspidea varicolor* Cr., has done some damage to the foliage of young prune and pear trees in Nevada County. It works upon *Ceanothus* sp. in the mountains, having also been collected in Placer and El Dorado counties.—E. O. ESSIG.

Bruchus pruininus Horn has been collected feeding upon rose bushes on the Capitol Park.—E. O. ESSIG.

The harlequin cabbage bug, *Murgantiaa histronica* Hahn, is very common on cabbage at Chicago Park, Nevada County, Cal., this summer.—E. O. ESSIG.

The elm-leaf aphis, *Schizoneura rileyi* Thos. (*S. ulmi* Riley) has recently been reported by S. H. Essig as occurring on the American elm at Ventura, California. This appears to be the first report of this insect in this State.—E. O. ESSIG.

NOTES FROM THE COUNTY COMMISSIONERS.

Alameda County.

Commissioner Fred Seulberger is advising the control of the pear and cherry slug, which is doing much damage to the orchards of his county.

Butte County.

Black scale is showing up in considerable numbers in the olive orchards of Butte County, and control arrangements are being made by Commissioner Earl Mills.

Imperial County.

The date for the examination for county horticultural commissioner is August 14, 1913.

Inyo County.

Mr. Richard Baird has tendered his resignation as county horticultural commissioner.

Madera County.

Commissioner George Marchbank and Mr. Geo. P. Weldon have recently made an orchard inspection of the eastern part of the county.

Mendocino County.

Examination for county horticultural commissioner will be held at Ukiah, August 19, 1913.

Nevada County.

Commissioner D. F. Norton has been using a spray composed of 10 pounds arsenate of lead, 10 pounds lime and 100 gallons of water as a means of preventing grasshopper attacks on young orchard trees. The lime appears to have some value as a repellent.

San Bernardino County.

Because of dry weather, Commissioner S. A. Pease reports unusual abundance of Russian thistle, powdery mildew of the apple, woolly aphis, codling moth, citrus red spider and walnut aphis.

San Luis Obispo County.

This county is still without a horticultural commissioner. The names of 36 signers to a petition were handed in, but supervisors would not act. The growers mean business and will send in another petition, hoping to meet all objections.

Santa Barbara County.

Commissioners C. W. Beers and Mr. H. S. Fawcett are conducting some studies relative to black sap of walnuts, which has appeared somewhat serious this year.

Work is also being conducted by the University of California to devise the control of certain beetles and fungi attacking live oaks of Montecito.

The U. S. Department of Agriculture is experimenting with the carob tree at Santa Barbara, and present indications point to the commercializing of this plant as a new forage crop.

Santa Clara County.

Commissioner Earle Morris is recommendingg a spray of 2½ pounds arsenate of lead to 50 gallons of water for the second brood of the California oak moth. He advises applications while the caterpillars are small.

Sonoma County.

Commissioner Gallaway has been using poison bran successfully in combating grasshoppers in the vineyards of his county.

The grapevine beetle and hop aphis have ceased serious work and will probably do little damage this year.

Tulare County.

Commissioner A. G. Schulz has had wonderful success in keeping the orchards of his county free from serious citrus pests.

Ventura County.

Commissioner Vaile announces marked beneficial results in the control of walnut aphis by lime-sulphur spray applied in the spring, just as the buds are starting. The work was conducted by the State University.

Yolo County.

Commissioner Geo. H. Hecke has charge of his county's exhibit to be made at The Panama-Pacific International Exposition in 1915. In addition to this, he is actively engaged in making the county fair to be held August 22–25 a success.

QUARANTINE DIVISION.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, Cal.

The following extract from the report of the United States grand jury at San Francisco is herewith published by and with the consent of that body:

"Mediterranean Fruit Fly."

The attention of the jury has been directed to this matter, and it has been given very serious consideration and careful investigation. The quarantine officials, both State and Federal, have been examined, together with exhibits and specimens—many witnesses, including steamship officials and ship officers having been examined at length.

The seriousness of the introduction of this pest into the State of California does not appear to have been fully realized by the crews manning the vessels coming from Hawaii and other points where this fly exists, and we find a dangerous lack of knowledge on the part of the public generally. The seriousness and gravity of the present situation can not be overestimated. The ravages of this fly have ruined the fruit industry of Australia, and in less than three years it has devastated the fruits and vegetables of the Hawaiian Islands. It is generally conceded that should this fly obtain a foothold in the State of California, it means the ruin of the entire fruit industry, including many vegetables, of this great State. Hundreds of millions of valuable property are directly menaced and endangered. If the fly once finds a lodgment at any point in the State, the world will immediately quarantine against the entire State of California. This will mean that not one pound of fresh fruit can be shipped out for consumption elsewhere. Its damaging effect also upon the dry and canned fruit industry would be enormous.

Through the activities of this grand jury the importance of this matter has been forcibly brought home to the steamship companies and crews manning the boats. Some good has undoubtedly been accomplished, but we feel that we must direct the attention of all officials, State and Federal quarantine officers, the district attorney and the future grand jurors to the terrible consequences should the Mediterranean fruit fly obtain entrance to this State through the laxity on the part of any one charged with the duty of protection in this regard.

We find the present force of quarantine inspectors active, energetic, and alive to their responsibilities. We urge that their hands be upheld in every way possible, and that the force of inspectors be increased whenever and wherever necessary to safeguard those great interests.

We earnestly direct the attention of all fruit-growing bodies throughout the State and the coast to the situation, and urge upon them the utmost watchfulness and aid in actively supporting the good work now being done by the State and Federal quarantine officers."

To the rank and file of the horticultural quarantine division this tribute—to their sincerity of purpose, their collectivity of effort and adherence to a fixed policy of duty—from a body of broad minded men who had taken infinite pains to inform themselves of all the facts concerning the situation before arriving at these conclusions, is an incentive that will redound to the further protection of the allied horticultural and agricultural interests of California, and should present to the producers of this State the proper value, the fallacy and inconsistency of the assiduously published statements of certain agitated gentlemen that all of these same efforts are simply a matter of "political entomology." "Finis rationem excusat" is the motto of the quarantine division, and we of the service feel that the report of this grand jury has substantiated our belief that in so far as the Mediterranean fruit fly is concerned the end justifies the means.

SYNOPSIS OF WORK FOR MONTH OF JUNE, 1913.

SAN FRANCISCO STATION.

Horticultural imports.

		Parcels.
Ship inspected	31	
Passed as free from pests		53,324
Fumigated		2,476
Destroyed or returned		431
Contraband destroyed		25
Total parcels horticultural products for the month		56,256

Pests Intercepted.

From Honolulu—
Larvæ of *Ceratitis capitata* in tomatoes.
Larvæ of *Ducus cucurbitæ* in cucumbers.
Diaspis bromeliæ and *Pseudococcus* sps. on pineapples.
Aphis sps. on betel leaves.
Cylas formicarius in sweet potatoes.
Cryptorhynchus batatæ in sweet potatoes.
From Japan—
Aleyrodes citri, *Parlatoria* sps. and *Pulvinaria* sps., on orange trees.
From Tahiti—
Lepidosaphes beckii and *Morganella maskelli* on oranges.
From Florida—
Diaspis bromeliæ and *Pseudococcus* sps. on pineapples.
From Mexico.
Larvæ of *Trypetidæ* in mangoes.
Heilipus lauri in avocado seeds.
From China—
Cylas formicarius in sweet potatoes.

LOS ANGELES STATION.

Horticultural imports.

		Parcels.
Ships inspected	17	
Passed as free from pests		41,868
Fumigated		25
Destroyed		2
Returned		0
Contraband		0
Total parcels horticultural products for the month		41,895

Pests Intercepted.

From Belgium—
Diaspis zamiæ on *Cycas cercinalis.*
From British East Africa—
Crytorynchus mangiferæ in Mango seeds.
From Florida—
Lepidosaphes beckii and *Melanose* on pomelo.
From Illinois—
Chrysomphalus aurantii and *Parlatoria* sps. on palms.
From Massachusetts—
Pseudococcus citri on ferns.
From Maryland—
Pseudococcus longispinus on palms.
From Mexico—
Coccus hesperidum on palms.
From Pennsylvania—
Aleyrodes sps. on Gardenia.
From Tennessee—
Pseudococcus citri on ferns.

SAN DIEGO STATION.

Horticultural imports.

Ships inspected	15	
Passed as free from pests		12,889
Fumigated		2
Destroyed		2
Returned		0
Contraband		3
Total parcels horticultural products for the month		12,896

Pests Intercepted.

From Ohio—
Aspidiotus camelliæ on palms.
Mealy bug, *Aleyrodes* sp., and *Lepidosaphes* sp. on mixed plants.
From Pennsylvania—
Mealy bug on ornamental plants.
From Mexico—
Saissetia oleæ, *Pseudococcus* sp., *Aspidiotus* sp., *Lecanium* sp. on mixed ornamentals including croton, ivy, ferns.

SANTA BARBARA STATION.

Ships inspected ---------- 1
No horticultural imports.

EUREKA STATION.

Ships inspected ---------- None
No horticultural imports.

THE FRUIT-TREE LEAF-ROLLER.

(*Archips argyrospila* Walker.)

Order—Lepidoptera. Family—Tortricidæ.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture, Sacramento, Cal.

Introduction.

This pest is frequently reported as injuring the foliage and fruit of various trees in different parts of the country, often becoming so abundant that acres of orchards are defoliated and the crop ruined. In New York State, Colorado, and New Mexico orchardists have known of its ravages for many years. It is not a pest that commonly remains bad in one place for a number of seasons, but when at its height there are few that can do more injury in a short time. For years it may occur in a locality and its presence will not be known by the orchardists; suddenly it begins to increase in numbers until it becomes a pest of the greatest importance and control measures are necessary to check it. Usually after from two to five years of its destructive work parasites have multiplied to such an extent that it is practically eradicated by them, and for a number of years there may be little or no damage from it. When conditions happen to be just right again, there will be an increase in numbers and thus there are cycles of good and bad years.

Occurrence in California.

On June 24th in company with State Horticultural Commissioner, Dr. A. J. Cook, and County Horticultural Commissioner from San Diego County, Mr. H. A. Weinland, the writer visited several orchards in the vicinity of Julian. In one of these the leaf-roller had ruined much of the fruit, the damage being more noticeable because of a light crop. The foliage was also damaged to a considerable extent. We were told that last season the insect had made its appearance in orchards of this same locality but in lesser numbers. At the time of our visit many moths, a few larvæ and pupæ and an abundance of freshly laid eggs were seen. Not much has yet been determined in regard to the distribution of this pest in the State. A few egg-masses have been seen on trees in a number of places, and an unauthenticated report of severe injury has come from a locality which we have not yet had a chance to visit in order to determine whether or not the pest which did the reported damage was the leaf-roller.

Occurrence in Other States.

In 1891 Prof. C. P. Gillette, of the Colorado Experiment Station, published a bulletin, No. 19, in which he told about a serious outbreak of the pest in northern Colorado. For about four years his records show that it was bad, then larvæ parasites appeared which soon overcame it, and since then it has not been a pest of any consequence in that particular locality. In Bulletin No. 311 of the Cornell Experiment Station, Prof. Glenn W. Herrick describes the pest and its ravages in New York and other Eastern States. Mr. John B. Gill, of the Bureau of Entomology, made studies of this insect in Colorado and New Mexico

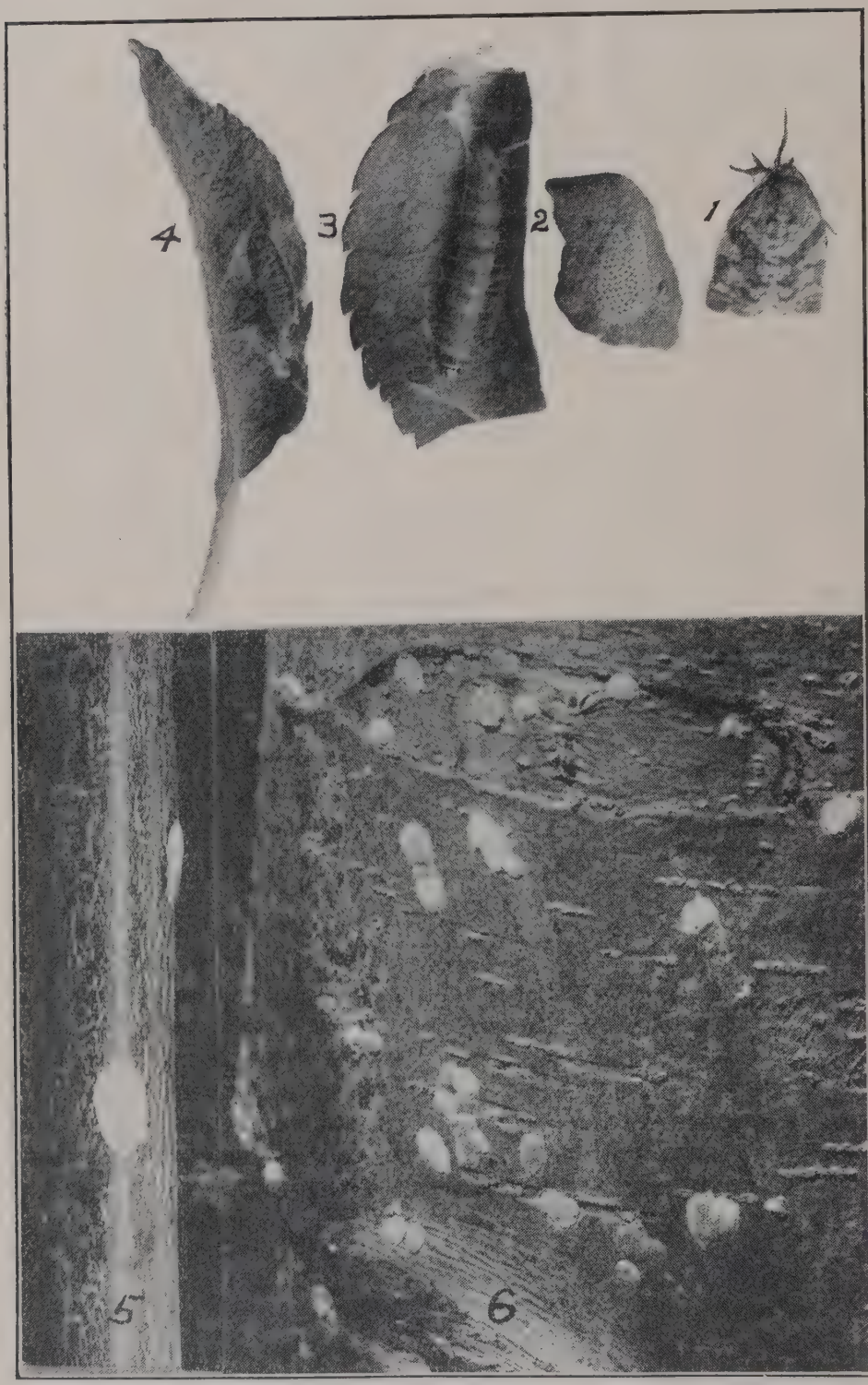

FIG. 357—The fruit-tree leaf-roller. 1, adult moth; 2, hatched egg mass on bark; 3, mature larva; 4, pupa; 5, light-colored egg masses on bark; 6, thirty-five hatched egg masses in a space of twelve square inches. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

and published a bulletin, No. 116, Part V. Prof. C. P. Gillette and the author of this article published, in 1912, life history records and results of laboratory and field experiments in Circular No. 5, Office of State Entomologist, Fort Collins, Colorado. Other references have been made to it by entomological writers from time to time, but probably nowhere has the damage been more serious than in Colorado and New Mexico during recent years. It is probable that only deciduous fruits would be attacked and of these the peach does not seem to be bothered to any extent.

The Egg Stage.

The fruit-tree leaf-roller passes the winter in the egg stage. In every case where its life history has been determined there is only one brood during a season, the eggs being laid in the summer and remaining unhatched until the following spring. Colorado records show that during the latter part of June and fore part of July most of the eggs are deposited. They may be found most anywhere on the bark of fruit trees, shade trees, shrubbery and berry bushes. When moths are abundant they frequently lay them on fence posts, barns, houses, etc. The writer has seen the side of a house, which during the summer season had been partly covered by a climbing rose bush, plastered so thick with egg masses that there were several hundred in a space of 10 or 12 square feet.

The individual masses are made up of from 10 to 150 eggs, all of which are covered with a sticky substance from the moth deposited with the eggs. This substance hardens and protects them in a compact oval or in some cases nearly circular flat mass, the greater diamater averaging about three sixteenths of an inch and the lesser one eighth of an inch.

When first laid the patches are generally greenish-yellow, but soon turn darker after exposure to the sun. There is quite a variation in color and many are light gray in the spring about hatching time.

Fig. 357, 5 and 6, shows a number of egg masses on apple tree. Fig. 357, 5, is from a picture of two very light colored masses; the upper one gives some idea of the thickness of an individual egg patch. In Fig. 357, 6, 35 egg masses are shown on the trunk of an apple tree in a space of about 12 square inches.

After the eggs are hatched the remaining shells may adhere to the trees for years. These may always be distinguished from the unhatched eggs by the perforations in the surface. The larvæ in emerging cut clean oval-shaped holes through the caps of the eggs so the number of holes in a mass indicates the number of larvæ that hatched from it. Fig. 357, 2, illustrates the appearance of a hatched egg mass.

The Larval Stage.

Shortly after the buds of fruit trees begin to burst open the tiny larvæ of the leaf-roller may be found feeding upon them. They do not all hatch at the same time, however, and there may be a period of two weeks or more during which hatching will be going on. At first the tiny worms are about one sixteenth of an inch in length and yellowish in color. Later they become a deep green with the head and thorax

black or brown. On an average a little less than thirty days is required for the larvæ to become full fed. During the time they are feeding the leaves and fruit are attacked. Webs are spun and by means of these, bunches of leaves and fruit are tied together. These turn brown if the attack is severe and there is no chance for any fruit to mature. Complete defoliation of trees by this pest is not at all uncommon where nothing is done to check it. Fig. 357, 3, is from a photograph of a full grown larva on a leaf.

FIG. 358.—The fruit-tree leaf-roller. 1, light-colored female moth; 2, dark-colored male from same egg mass; 3, light-colored female; 4, dark-colored female from the same egg mass as 3; 2, 4, 5 and 7 showing most characteristic markings. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

The Pupal Stage.

After the larvæ have become full grown they change to the pupal stage within a rolled up leaf or cluster of leaves. At first they are green in color, later changing to a dark brown, and in about ten days transformation to the moth stage takes place. Fig. 357, 4, shows a pupa photographed on a leaf where this stage was being passed.

The Moth.

(Fig. 358.)

The following description of the moth is copied from Circular No. 5, Office of State Entomologist, on "The Fruit-Tree Leaf-Roller in Colorado," by C. P. Gillette and Geo. P. Weldon:

"The moths measure from ten to thirteen millimeters, or from three eighths to one half of an inch, in length, with the wings closed; the expanse of the full-spread wings usually varies between eighteen and twenty-five millimeters, or from eleven sixteenths to one inch; the prevailing color is a rusty brown, varying in typical specimens from rather light to quite dark, and there is always present a large pale-yellow to almost white diagonal patch on the front or caustal margin of the wing a little beyond the middle; a smaller light area occurs on the front margin of the wing about halfway between the large light area and the base of the wings; the two light areas are separated by a dark rusty-brown diagonal band or stripe; this stripe and an area just beyond the large light patch are usually the darkest portions of the wings; the dark-colored area is more or less broken or mottled with pale-yellow scales; the abdomen and lower surface of the hind wing are light yellow, but the upper surface of the hind wing is usually more or less dusky or smoky in color, especially toward the distal portions; the male averages smaller than the female and has the light and dark coloration more sharply contrasted; in the darkest females the smaller light-colored area on the wing is sometimes obliterated; in the lighter examples the distal portion of the wing is often distinctly yellowish in color, with a greater or less number of rusty-brown scales intermingled, this light portion frequently connecting with the larger light area on the anterior margin of the wing; in extremely light examples, which occur with some frequency, the entire surface of the fore wing is light yellow in color, with slight rusty outlines, as shown in Fig. 358, 1. There are occasional specimens with very contrasting colors, in which the ground color of the wing is light yellow and the dark markings somewhat in the form of a letter Y across the wing near the central portion, as shown in Fig. 358, 6. In all cases where these moths with the extreme light or dark colors have been reared we have obtained them from individual egg masses, from which the greater number of the moths had the typical color markings shown in Fig. 358, 2, 5 and 7. In all the examples we have reared, the very light-colored examples have been females, while it is not uncommon for the darker-colored individuals to be females also."

FIG. 359.—General view of orchard in which tree in Fig. 360 was photographed, showing defoliation of the fruit trees. The trees with the heavy foliage are elms, and were not attacked by the leaf-roller. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

Food Plants.

The fruit-tree leaf-roller is principally a fruit pest as its name indicates; it is quite an omniverous feeder, however, and may be found eating the foliage of many shade trees as well as herbaceous plants. Fig. 359 shows some elm trees which were not attacked alongside an apple orchard in which the foliage had practically all been destroyed at the time the picture was taken. In Circular 5, from Office of State Entomologist of Colorado, the following list of trees and plants which larvæ were found feeding upon is given: plum, cherry, pear, currant, gooseberry, raspberry, rose, poplar, elm, locust, alfalfa and onion. The alfalfa and onions were growing between tree rows where the larvæ had practically eaten all the leaves, and upon dropping to the ground webs were spun over everything with which they came in contact, and more or less feeding took place on all kinds of green plants. Fig. 360 illustrates this condition quite well.

Injury.

Something has already been said about the injury done to orchards by the leaf-roller. This injury assumes several different forms—

1. The blossoms are partly or wholly destroyed very early in the season.
2. The fruit and foliage are partly or wholly destroyed somewhat later.
3. The next season's crop is destroyed as well as the current season's.

The first form of injury which results in the destruction of the fruit also comes as a result of an abundance of worms which hatch very

early and which begin feeding on the tender blossoms even before they have had time to open up. The organs of the flower are destroyed so that fertilization is impossible and the flowers and fruit have no chance to develop. The second form of injury is always found when the leaf-roller is present. Both the fruit and the foliage are fed upon. If the larvæ are abundant enough they may destroy all the leaves and fruit; if they occur in lesser numbers there may be a partial defoliation and

FIG. 360.—Photograph taken in an unsprayed orchard, showing a trunk covered with webs; also the alfalfa at the base matted down with them. All the foliage in this orchard was destroyed. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

the fruit may be injured more or less seriously. Apples will usually develop when they have been attacked, but are ill-shapen and unmarketable. Fig. 361 illustrates early attacks of the worms and later development of the fruit. The third form of injury is one that is not usually reckoned upon by the average fruit grower, and probably always follows complete defoliation. Several orchards in Colorado, which were badly damaged in 1912; in fact so badly that practically all the leaves

turned brown and dried up, were examined in the late spring of 1913. Absolutely no fruit buds had developed the previous season, consequently the leaf-roller was responsible not only for the loss of the crop during the season when they defoliated the trees, but the succeeding

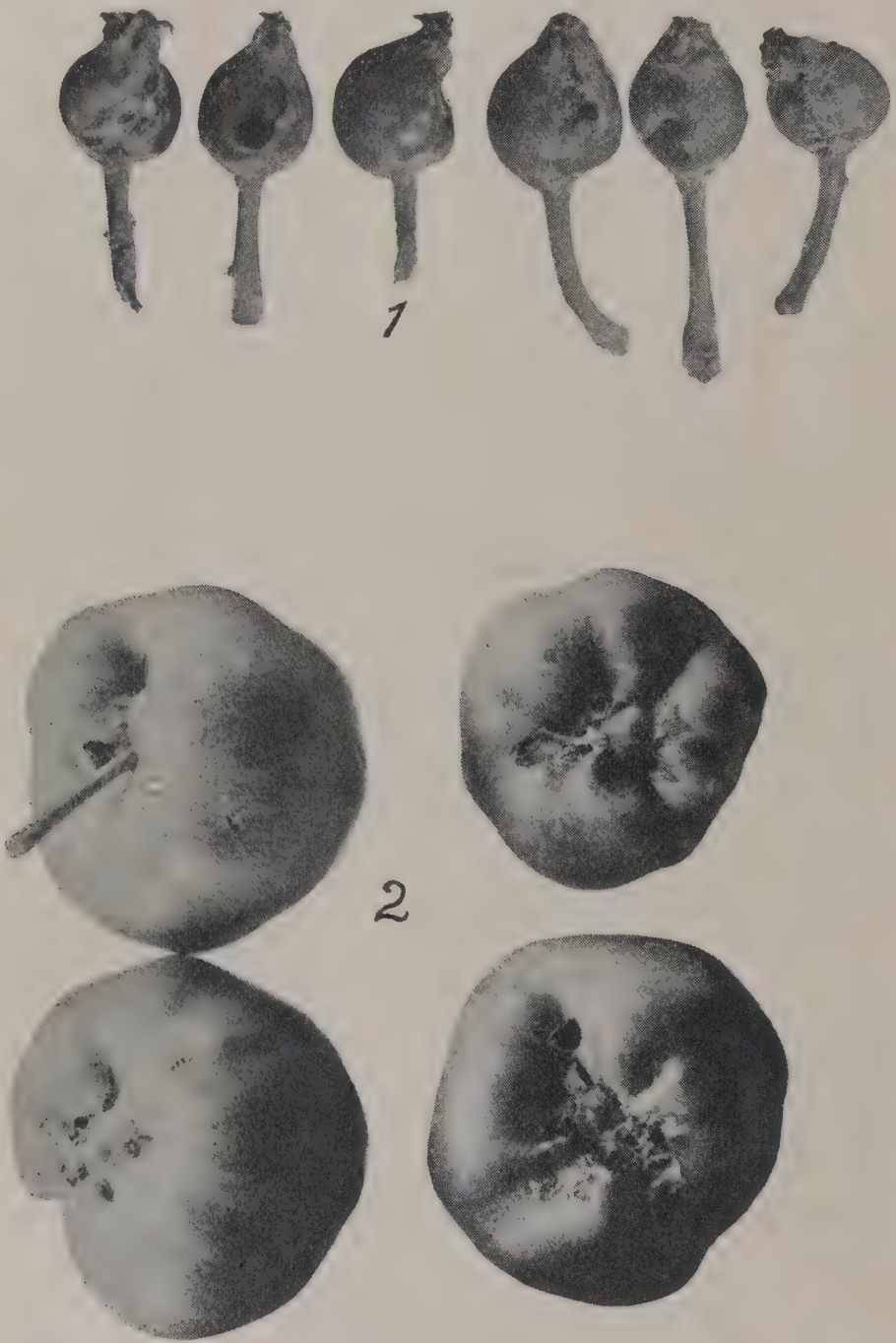

FIG. 361—Work of the fruit-tree leaf-roller on apples. 1, apples picked on June 8, when they were from five eighths to three quarters of an inch in diameter, showing the characteristic injury from the leaf-roller; 2, apples picked from the same orchard on August 9, when they were about two inches in diameter. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

season as well. These orchards inspected were treated during the spring of 1913 with a soluble oil spray so that the leaf-roller was practically eradicated and the foliage was fine, but no fruit was present. The fact that a severe attack by this pest during any one season may

mean the loss of two seasons' crops should be sufficient to impress upon any orchardist the necessity for using control measures just as soon as it appears.

Control.

Adequate means of control have now been worked out, and the damage that has been done in certain sections in the past, where there has been an outbreak of this serious insect, may be averted in the future. Certain sprays have proven to be effective in destroying the egg, still others the larvæ, and the orchardist who will do the spraying thoroughly with the materials recommended need have little fear of failure in protecting his crop.

SPRAYS TO KILL THE EGGS.

As the winter season is always spent in the egg stage, it was only necessary to find some spray which when applied during the dormant season, would kill them. A long series of laboratory experiments were carried through by Prof. C. P. Gillette in 1895, and by the writer in 1912; also a series of orchard experiments were conducted during the latter year. In these it was found that an oil spray of some kind or other, would penetrate through the tough, very impervious coating of the egg mass, and kill the eggs beneath. Various strengths of kerosene emulsion were used in the work with good results in some cases and not so good in others. The variable results attained with this material were such that it could not be recommended. While in some cases an emulsion containing a certain percentage of kerosene would kill all egg masses to which it was applied, in others the same strength of material in a different emulsion would fail to kill many of them.

Miscible Oils.

Nothing was found to be more effective in the work of killing the eggs than the various brands of the commercial products known as soluble or miscible oils. Of these preparations three kinds, viz, Target Brand Scale Destroyer, Scalecide and Carboleine were used with splendid success. Applications were made with various strengths and the results indicated that they should not be used weaker than one gallon of soluble oil to nineteen gallons of water. Fig. 362 shows a sprayed and unsprayed tree. The lower one was sprayed with Target Brand Scale Destroyer one part to nineteen of water.

This season before coming to California the writer helped in the work of spraying for the control of this insect in the worst infested sections of Colorado. In one of these every grower who was known to have leaf-roller in his orchard sprayed. Remarkable results were attained in all cases where spraying was thoroughly done. Some few people tried to get along with from three to five gallons of spray per tree where double the amount should have been used. They of course met with a certain degree of failure.

FIG. 362.—1, unsprayed tree in orchard, photographed on June 8; 2, tree sprayed with Target Brand soluble oil, photographed on the same date. (After Gillette and Weldon, Cir. 5, Colo. State Ent.)

Crude Oil Emulsion.

Some preliminary work was done to determine the effect of a good crude oil emulsion upon the eggs. These tests while not extensive enough for definite conclusions, indicated that such an emulsion would give excellent results. Two strengths were used, viz, $12\frac{1}{2}$ and $16\frac{2}{3}$ per cent. No specific gravity test was made of this oil. It was, however, the crude product just as it was pumped from the wells at Florence, Colorado. It is very probable that any of the good distillate or crude oil emulsions that are used successfully in the control of scale insects in California could be used to good advantage in destroying leaf-roller eggs also.

Lime and Sulphur Useless.

Owing to the fact that lime and sulphur has often been suggested as a remedy it seems well to mention in this article, the fact that many careful experiments have proven beyond a shadow of a doubt that this preparation is of no value at any strength in destroying leaf-roller eggs.

SPRAYS TO KILL LARVÆ.

As the larvæ feed upon the foliage it would seem that they could be easily controlled by means of an arsenical spray. They are found, however, to resist much stronger doses of arsenate of lead, etc., than many others of our chewing insect, *e. g.*, codling moth. It is possible to kill quite a large percentage of the worms when they are small, by very heavy applications of an arsenate of lead spray used at the strength of three pounds to fifty gallons of water. Trees when sprayed should be thoroughly drenched. It is important also that spraying begin just as soon after the eggs have begun to hatch as possible. Roughly speaking this will be very soon after the leaves have begun to come out in the spring. A second application should be made in the case of apples just before blooming and after the buds in the blossom clusters have separated one from another. The object of a spray at this time is to cover the entire surface of the blossom cluster with the poison in order that many of the larvæ which ordinarily feed upon the blossoms may be killed. The third arsenical spray for leaf-roller on apple trees will serve the dual purpose of a leaf-roller and codling moth spray and should be applied when 90 per cent of the petals have fallen and before the calyx cups close. Later sprays will do little or no good in controlling the pest, as the worms become very resistant to the poison as they get larger, and are well protected by curled leaves.

Black Leaf "40" was used with good success in the experimental work in Colorado, when the worms were very small. Two applications made at the time indicated for the first two arsenical sprays will kill a large percentage of the larvæ. It should be used at the strength of one part of Black Leaf "40" to eight hundred parts of water.

SPRAYING MUST BE THOROUGH.

Too much stress can not be placed upon thoroughness in spraying for this pest. They are so well protected by the folds of leaves in which they feed that it is only by the use of very heavy, drenching sprays that the larvæ may be killed. This does not apply so much to the spray to kill the eggs although in this case every mass missed endangers the tree that much more, and it does not take many of them when they hatch to produce enough larvæ to infest a tree seriously.

SULZER APPLE PACKING AND GRADE LAW.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the standard barrel for apples shall be of the following dimensions when measured without distention of its parts: Length of stave, twenty-eight and one half inches; diameter of head, seventeen and one eighth inches; distance between heads, twenty-six inches; circumference of bulge, sixty-four inches outside measurement, representing as nearly as possible seven thousand and fifty-six cubic inches, provided that steel barrel containing the interior dimensions provided for in this section shall be construed as a compliance therewith.

SEC. 2. That the standard grades for apples, when packed in barrels which shall be shipped or delivered for shipment in interstate or foreign commerce, or which shall be sold or offered for sale within the District of Columbia or the territories of the United States, shall be as follows:

Apples of one variety, which are well-grown specimens, hand picked, of good color for the variety, normal shape, practically free from insect and fungous injury, bruises, and other defects except such as are necessarily caused in the operation of packing; or apples of one variety which are not more than ten per centum below the foregoing specifications, shall be "Standard Grade minimum size two and one half inches," if the minimum size of the apples is two and one half inches in transverse diameter; "Standard Grade minimum size two and one fourth inches," if the minimum size of the apple is two and one fourth inches in transverse diameter; or "Standard Grade minimum size two inches," if the minimum size of the apples is two inches in transverse diameter.

SEC. 3. That the barrels in which apples are packed in accordance with the provisions of this act may be branded in accordance with section two of this act.

SEC. 4. That all barrels packed with apples shall be deemed to be below standard if the barrel bears any statement, design or device indicating that the barrel is a standard barrel of apples, as herein defined, and the capacity of the barrel is less than the capacity prescribed by section one of this act, unless the barrel shall be plainly marked on end and side with words or figures showing the fractional relation which the actual capacity of the barrel bears to the capacity prescribed by section one of this act. The marking required by this paragraph shall be in black letters of size not less than seventy-two point one inch gothic.

SEC. 5. The barrels packed with apples shall be deemed to be misbranded within the meaning of this act:

First—If the barrel bears any statement, design or device indicating that the apples contained therein are "Standard Grade" and the apples, when packed, do not conform to the requirements prescribed by section two of this act.

Second—If the barrel bears any statement, design or device indicating that the apples contained therein are "Standard Grade" and the barrel fails to bear also a statement of the name of the variety, the name of the locality where grown and the name of the packer or the

person by whose authority the apples were packed and the barrel marked.

SEC. 6. That any person, firm or corporation, or association who shall knowingly pack or cause to be packed apples in barrels, or who shall knowingly sell or offer for sale such barrels in violation of the provisions of this act, shall be liable to a penalty of one dollar and costs for each such barrel so sold or offered for sale, to be recovered at the suit of the United States in any court of the United States having jurisdiction.

SEC. 7. That this act shall be in force and effect from and after the first day of July, nineteen hundred and thirteen.

PAJARO VALLEY APPLE GRADE RULES.

The committee formed for the purpose of establishing grades or standards for Pajaro Valley apples, after hearing all parties interested and after taking into consideration the character of our fruit and the markets it is destined to reach, begs leave to submit the following report, which report has been approved and adopted by the four fruit-growers' associations now formed in Santa Cruz County, viz:

Corralitos Fruit Growers' Association.
Carlton Fruit Growers' Association.
Casserly Fruit Growers' Association.
Soquel Fruit Growers' Association.

Fancy or No. 1 Grade.

Apples placed in this grade must be mature and of normal shape for the variety and free from defects except leaf and limb rub, russet and similar defects which have not distorted the fruit and which do not aggregate more than one half inch in diameter, will be allowed. Wormy apples must be excluded from this grade, also all apples less than two and one fourth ($2\frac{1}{4}$) inches in diameter.

No. 2 Grade.

In this grade may be placed all merchantable apples not included in the fancy or No. 1 grade. All apples must be free from bruises with skin unbroken and of good shape. Sizes smaller than two and one half ($2\frac{1}{2}$) inches not allowed.

Boxes.

We recommend the adoption, as far as possible consistent with cleaning up shooks now on hand, of the Northwestern standard box, which is ten and one half ($10\frac{1}{2}$) inches by eleven and one half ($11\frac{1}{2}$) inches by eighteen (18) inches inside measurement, and the diamond or diagonal pack, and we further strongly recommend that each grower provide himself with orchard picking boxes, to the end that our fruit shall reach the markets in bright, new and clean boxes.

Proper Marking.

In marking boxes, care should be taken that all marks are placed in a neat manner and in the proper place; the grower's name (if desired),

the grade, variety and number of apples in the box should appear on the labeled end of the box, above the label. We suggest that the following rule be adopted:

John Doe, or No. 21.	Fancy.	Bellefleurs. 112.

All boxes containing apples graded fancy must bear the Association label on the end of the box.

Inspection.

Each box containing fancy grade apples shall bear with it an inspection certificate, reading as follows:

Official Inspection Certificate.

The apples in this box have been packed by Packer No. ————, and we hereby guarantee the contents to conform to the standard adopted by us on April 19, 1913, and which is as follows: (wording of grade).

Signed _____ Association.

*RULES AND SPECIFICATIONS FOR GRADING AND PACKING APPLES.

Adopted by North Pacific Fruit Distributors.

After four days' consecutive work, the managing board of the North Pacific Fruit Distributors announced the following rules and specifications for grade and pack of apples to be handled through the organization. The grades to be used will be designated as extra fancy, fancy and C grades, corresponding to Nos. 1, 2 and 3, defined as follows:

Extra Fancy.

This grade shall consist of sound, smooth, matured, clean, hand-picked, well formed apples only, free from all insect pests, disease, blemishes, bruises and other physical injuries, stings, scald, scab, sun scald, dry or bitter rot, worms, worm holes, decay, spray burn, limb rub, water core, skin puncture or skin broken at stem. All apples must be of good matured color, shape and condition characteristic of the variety. The following varieties defined as to color shall be admitted to this grade:

Solid Red Varieties—Aiken Red, Arkansas Black, Black Ben Davis, Fall Wine, Gano, Jeniton, Jonathan, King David, Mammoth Black Twig, Missouri Pippin, Oregon Red, Spitzenburg (Esopus), Steele Red, Vanderpool.

Striped or Partially Red Varieties—Ben Davis, Delicious, Gravenstein, Hubbardson Nonesuch, Jeffries, King of Tompkins County, McIntosh Red, Northern Spy, Rome Beauty, Stayman, Snow, Wagener, Wealthy, York Imperial.

Color requirements for extra fancy are as follows:

Solid red varieties to have not less than three fourths good red color and the size of 175 and smaller when admitted to the grade to have at least 90 per cent good red color.

*From the Northwest Horticulturist, August, 1913.

Striped or partially red varieties as designated above to have not less than one half good red color; when the size of 175 or smaller is admitted to this grade they must have at least three fourths good red color.

Except that Gravensteins, Jeffries and King of Tompkins County in all sizes must be at least one third good red color.

Red cheek or blushed varieties, such as Hydes King, Red Cheek Pippin, Winter Banana, Maiden Blush, must have a red cheek.

Ortleys must be white, yellow or waxen.

Yellow or green varieties, such as Grimes Golden, White Winter Pearmain, Yellow Newtown and Cox's Orange Pippin must have the characteristic color of the variety. No sizes admitted to this grade smaller than as follows:

Aiken Red, 200; Arkansas Black, 175; Ben Davis, 163; Black Ben Davis, 163; Cox's Orange Pippin, 163; Delicious, 150; Fall Wine, 200; Gano, 163; Grimes Golden, 200; Gravenstein, 200; Hubbardson Nonesuch, 163; Hydes King, 150; Jeniton, 200; Jonathan, 200; Jeffries, 225; King of Tompkins County, 163; King David, 200; Mammoth Black Twig, 150; Missouri Pippin, 200; McIntosh Red, 200; Maiden Blush, 163; Northern Spy, 150; Oregon Red, 175; Ortley, 175; Rome Beauty, 163; Red Cheek Pippin, 163; Spitzenburg (Esopus), 200; Steele Red, 163; Stayman, 163; Snow, 225; Vanderpool, 163; Winesap, 225; Wagener, 200; Winter Banana, 150; White Winter Pearmain, 200; Wealthy, 200; Yellow Newtown, 225; York Imperial, 163.

All boxes to be lined and cardboard to be used top and bottom.

Fancy Grade.

In the grade all apples must be matured, hand picked, clean and sound, free from insect pests, water core, sun damage, broken skin, scald, scale, dry or bitter rot, worms, worm stings, infections, diseases and all other defects equally detrimental, excepting that slight limb or leaf rub, scratches or russeting will be permitted provided that no apple shall show total blemishes aggregating more than one half inch square. Fruit clearly misshapen, bruised or bearing evidence of rough handling shall not be permitted in this grade.

The varieties admitted to this grade are the same as in the extra fancy. All boxes are to be lined and cardboard to be used top and bottom.

Color requirements are as follows:

The solid red varieties must have fully one third of good solid red color. Striped or partially red varieties must have at least one fourth of good red color. All apples of a green or yellow variety shall be of characteristic color.

No sizes shall be admitted to this grade smaller than as follows: Aiken Red, 175; Arkansas Black, 163; Ben Davis, 150; Black Ben Davis, 150; Cox's Orange Pippin, 150; Delicious, 150; Fall Wine, 175; Gano, 150; Grimes Golden, 175; Gravenstein, 175; Hubbardson Nonesuch, 150; Hyde's King, 150; Jeniton, 175; Jonathan, 175; Jeffries, 200; King of Tompkins County, 150; King David, 175; Mammoth Black Twig, 150; Missouri Pippin, 175; McIntosh Red, 175; Maiden Blush, 150; Northern Spy, 150; Orange Red, 163; Ortley, 163; Rome

Beauty, 150; Red Cheek Pippin, 150; Spitzenburg (Esopus), 150; Steele Red, 150; Stayman, 150; Snow, 200; Vanderpool, 150; Winesap, 200; Wagener, 175; Winter Banana, 150; White Winter Pearmain, 175; Wealthy, 175; Yellow Newtown, 200; York Imperial, 150.

Single Grade.

The following apples to be packed in one grade, combining the extra fancy and fancy grades as provided by these grading rules, size not smaller than 163 count, windfalls absolutely excluded. This pack to be marked or labeled as "Fancy": Apple of Commerce, Baldwin, Ben Hur, Bismarck, Canada Red, Chicago, Champion, Delaware Red, Golden Russet, Hoover, Ingram, Kaighn Spitzenburg, Kentish, Kinnard, Manu, Mother, N. W. Greening, Pewaukee, Pryor Red, Rambo, Rhode Island Greening, Roy Russett, Russian Red, Salome, Shakelford, Senator, Stark, Swaar, Wallbridge, Westfield, Willow Twig, Yellow Bellefleur, McMahon.

Exceptions.

Summer varieties such as Astrachan, Bailey's Sweet, Beitigheimer, Duchess, Early Harvest, Red June, Strawberry, Twenty-Ounce Pippin, Yellow Transparent and kindred varieties not otherwise specified in these grading rules, together with early fall varieties, such as Alexander, Blue Pearmain, Wolf River, Spokane Beauty, Fall Pippin, Waxen, Talman Sweets, Sweet Bough and other varieties not provided for in these grading rules as grown in sections of early maturity, shall be packed in accordance with the grading rules covering fancy grade as to defects, but regardless of color rules; size not smaller than 163 count for the larger growing varieties and 225 count for the smaller growing varieties; windfalls to be absolutely excluded. All boxes to be lined and cardboard used top and bottom.

C Grade.

This grade is provided to be used when market requirements justify and shall consist of apples not smaller than 163 count. This grade shall be made up of all merchantable apples not included in extra fancy or fancy grades. Apples must be free from all insect pests, worms, worm holes, and infectious diseases. Serious physical injuries, skin puncture, bruised or broken skin will not be permitted, and not exceeding two stings, thoroughly healed. There are no requirements as to color except that the fruit must be matured. This grade to be packed in accordance with trade requirements.

Indorsements.

Your executive board advises the use of the regular Northwestern standard box in all sections, inside measurements 10½ by 11½ by 18, with solid ends. We believe that we should make this the uniform box as standard in all sections. Inasmuch as the laws as well as the trade requirements will force us to sell our apples by numerical count, we abolish the system of designating or manifesting fruit by tiers and we employ the numerical system exclusively hereafter.

The recognized and indorsed counts for the Northwestern standard apple pack are as follows: 36, 45, 48, 56, 64, 72, 80, 88, 96, 104, 112, 113, 125, 138, 150, 163, 175, 188, 200, 213, 225.

Crab Apples.

These should be carefully assorted as to varieties, making one grade only, keeping out all insect pests, worm holes, sting, scale, misshapen and blemished fruit. Put up in apple boxes; line the box; fill in gently, so as to prevent bruising.

Lady Apples.

These should be packed in half boxes, boxes lined, remembering that the more attractive the better the sale. Make only one grade, keeping out all insect pests, worm holes, sting, scale, misshapen and blemished fruit.

A CONSTANT MENACE.

By Frederick Maskew, Chief Deputy Quarantine Officer.

Among many other articles of freight, the Steamship Ventura brought to San Francisco from Honolulu a crate of fresh pineapples consigned to R. I. Lillie, Stewart Hotel, San Francisco. In common with all importations of horticultural products this crate and its contents were inspected and as a result forty live *Spenophorus rhabdocnemis obscurus* Boisd., the Hawaiian sugar-cane borer, were found in the package. These insects were fully one half inch long, and of several shades of rich brown in color, which made them easy of detection. The package, its contents and the weevils were promptly destroyed.

It is not the purpose of this article to detail the biology of this pest or to speculate on whether it might have adapted itself to host plants other than the sugar cane had it passed into this State undetected, but rather to point out that every vessel, every person, every automobile, box, crate, bundle, sack and package arriving from Hawaiian ports is a potential danger to the horticultural interests of California.

There is no record extant of this species of weevil attacking pineapples, and it is our opinion that this crate of pineapples had been placed after packing in some location where these insects occurred and the forty specimens we captured had entered the crate as a place of hiding. There is no record of the Mediterranean fruit fly infesting pineapples in Hawaiian territory, but if the packing is done, or the material used in packing is stored, or the packed cases are stored in the vicinity of any material infested with this pest, the larvæ on seeking a place to pupate are just as likely to wriggle themselves in the crevices of the crates as did the specimens of weevils we found. All pineapples destined for California points are subjected to a fumigation at San Francisco, with a strength of gas fully three times as great as that used on the citrus trees in California before they are released from the dock, but I doubt if even that strength would destroy the Mediterranean fruit fly in its pupal stage if any were secreted in the crevices of the crates. A box of soap purchased in a Chinese store in Honolulu, where it has laid in close contiguity to a sack of peppers infested with the maggots of the fruit fly, may contain pupæ of this pest, and is just as likely to bring the fly over in safety as a specimen of fruit infested with the larva. Here at quarantine in San Francisco we have found the pupa of the Mediterranean fly attached to the seams

on the inside of gunny sacks that had contained bell peppers, and, as a result of this finding, refuse to release from the docks any material arriving from Hawaiian territory packed in old or used sacks. All such material must be emptied out, repacked in California sacks, the original sacks cut in four pieces, sent to the incinerator and burnt before the material is released by the quarantine officers.

If Hawaiian producers continue to seek a market in California for such of their products as are at present immune from the attacks of the Mediterranean fruit fly, California should insist upon an official record that every shipment of all such products, from the time they were cut in the field, through all the processes of packing, hauling and storing, had not been in the immediate vicinity of any material infested with the Mediterranean fruit fly.

No one comprehends more clearly than the writer that laws, rules or regulations made in California are not susceptible of enforcement in Hawaii, but the fact remains that in this particular instance, although California failed to take advantage of this position at the outset, the State is still master of the situation and can always decide as to what products shall enter this port.

THE RED-HUMPED CATERPILLAR.

(*Schizura concinna* S. & A.).

Order—Lepidoptera. Family—Notodontidæ.

By E. J. Vosler, Assistant Superintendent, State Insectary.

Summary.

1. Considerable damage is often done during this season of the year by the red-humped caterpillar on walnut, apple and allied plants.

2. The work of this insect consists in the stripping of the leaves from the branches of its host plant.

3. The larva is easily recognized by the coral-red hump on the fourth segment (first abdominal segment). The head is of the same color and the body striped with slender bands of black, yellow and white. There are two rows of prominent black tubercles along the back and shorter ones on the sides.

4. The pest is abundant during June, July, August and a part of September.

5. It is distributed over practically the whole United States, but seems to be confined to the central portion of this State.

6. Control measures consist in hand-picking on small trees and by the use of arsenical sprays in large orchards where the former procedure is impracticable.

7. Natural enemies are abundant and are important factors in the control.

Injury.

The damage caused by the insect varies considerably; sometimes the entire trees are defoliated, and then again just one small branch is attacked, the insect disappearing before all the leaves have been consumed. This latter appears to be the case around Sacramento on walnut trees, where only a few branches on the trees were defoliated, the injury done being of little economic importance.

Work.

The work of the larvæ consists in the partial defoliation of the host, particularly during July and August. Sometimes entire branches are stripped of their leaves, the larvæ leaving only the tough mid-ribs. The young larvæ begin feeding generally at the tips of the branches where the foilage is tender, gradually working down toward the base of the branch.

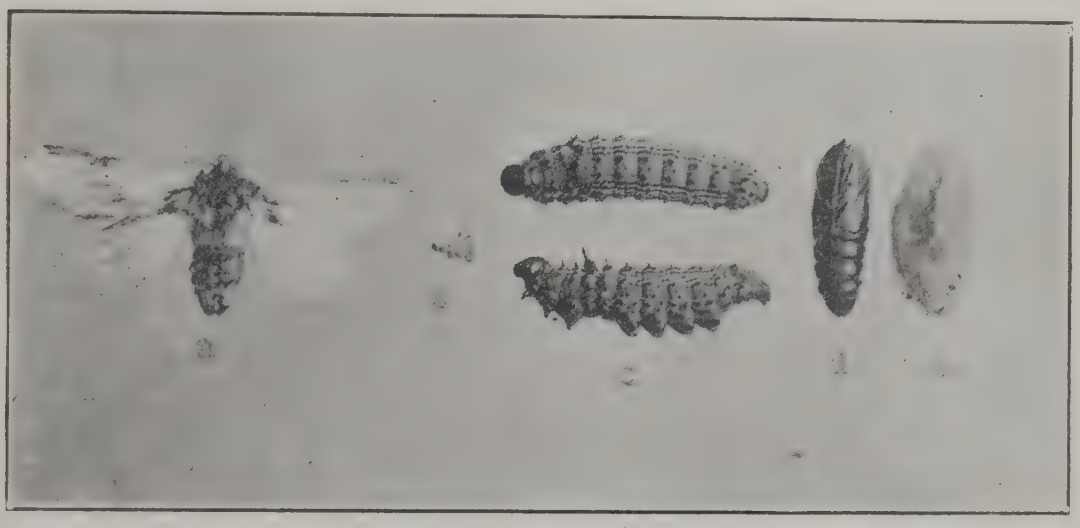

FIG. 363. The red-humped caterpillar, *Schizura concinna* S. & A. a, adult moth; b, egg cluster; c, larvæ or caterpillars; d, pupa; e, cocoon. About natural size. (Original.)

Description.

The adult moth, Fig. 363, a, is of an inconspicuous grayish and brown color; length of body, approximately, five eighths of an inch: wing expanse, one and a fourth to one and three eighths inches. The eggs, Fig. 363, b, are about the size of an ordinary pin-head; are light in color and are deposited in masses on the leaves. The full grown larva, Fig. 363, c, varies in length from one and a fourth to two inches. The head is coral red, being the same color as the fourth segment (first abdominal segment), which is enlarged so as to form a distinct hump. The pupa, Fig. 363, d, is tan to dark brown in color. Length, five eighths to three fourths of an inch. The cocoon, Fig. 363, e, inclosing the pupa, is of a parchment-like texture, being made of small whitish thread secreted by the larva. Length, about seven eighths of an inch.

Life History.

The moths emerge in May, June and July and deposit their eggs in clusters on the leaves. The larvæ are voracious feeders, rapidly consuming the leaves. When not eating they are to be found bunched together on a leaf, which can be picked off and consequently the whole colony destroyed. As the larvæ become older, the tendency to remain bunched together is not so marked. They are most abundant in June and July, the number gradually decreasing until September, when they become quite scarce. During the last of July and the following two months larvæ become full grown, drop to the ground where they transform to the pupal or resting stage in a thin cocoon. These

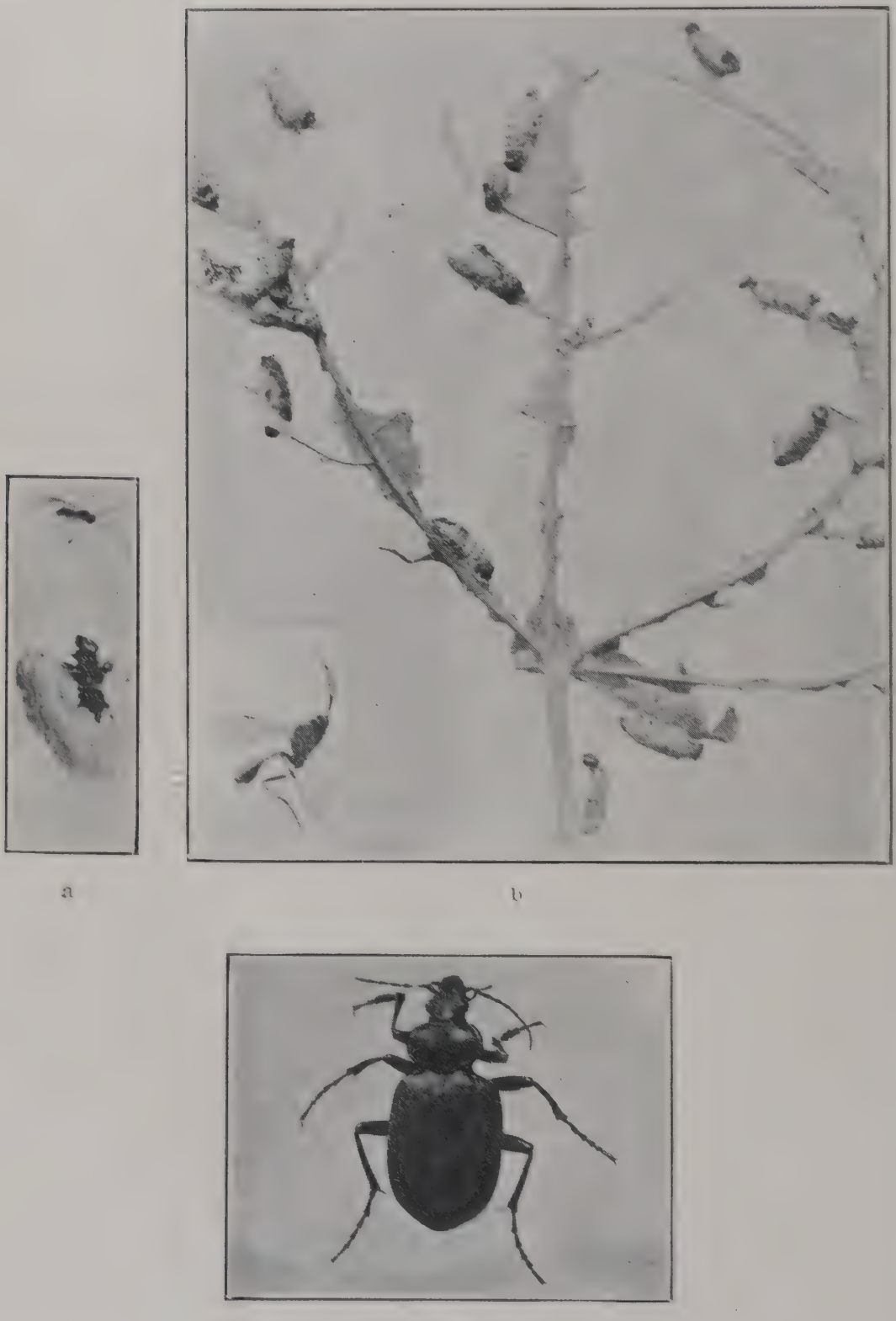

Fig. 364.—Natural enemies of the red-humped caterpillar, *Schizura concinna* S. & A. a, showing caterpillar with cocoons of *Apanteles* sp. and the adult parasite; b, cocoons of *Limneria*n sp. enclosed by the remains of the dead caterpillars still clinging to the twigs and adult of *Limneria*n sp.; c, imported enemy, *Calosoma scrophanta*, of the red-humped caterpillar. (Original.)

cocoons are found from one to three inches under the ground, or among the rubbish and leaves under the trees. The winter is passed as a pupa, the adult emerging in the late spring and early summer.

Control.

This pest is easily controlled by hand-picking, which is to be commended for use on small trees. On large trees, of course, this would be impossible, and arsenical sprays can be used. Arsenate of lead, using a strength of five pounds to one hundred gallons of water, will do the work admirably.

Distribution.

The red-humped caterpillar in California is common in the central portion of the State. It is well distributed over the whole United States.

Food Plants.

Mr. E. O. Essig[1] gives the following food plants: Apple, hawthorne, prune, plum and cherry. Some damage is also done to the walnut trees by this insect.

Natural Enemies.

Late in July and August the natural enemies of the red-humped caterpillar are abundant and exercise an important factor in its control. One parasite which does a great amount of good is *Apanteles* sp. (Fig. 364, a), belonging to the family *Braconidæ* of the order *Hymenoptera*. Numerous individuals emerge from a single larva and spin their whitish cocoons near or on the body of the host. Fig. 364, a, shows the cocoons of *Apanteles* with the remains of the host, also the adult insect.

Another important parasite is *Limnerium* sp. The cocoons of this parasite clustered on a branch, together with the adult parasite, are shown in Fig. 364, b. Unlike *Apanteles*, only one *Limnerium* emerges from each host.

The State Insectary has recently imported a predaceous beetle which we hope will prove of value as an enemy of the red-humped caterpillar. It feeds on this host in both the larval and adult stages. The adult of this beetle is shown in Fig. 364, c, and is only known by its scientific name of *Calosoma sycophanta*.

[1] Injurious and Beneficial Insects, Monthly Bulletin, State Commission of Horticulture, 1913, Volume 2, Nos. 1 and 2, page 188.

THE FRUIT-TREE BARK-BEETLE.

(*Scolytus rugulosus* Ratz.)

Order—Coleoptera. Family—Scolytidæ.

By E. O. Essig, Secretary, State Commission of Horticulture.

The fruit-tree bark-beetle or shothole borer has just been reported as working upon apricot trees at Ontario, California, by Dr. Edwin C. Van Dyke, of the University of California. To our knowledge, this is the first authentic report made of this beetle in California, and is, therefore, of considerable importance.

The beetles are very small, being one tenth of an inch long and about one third as wide. The body is black, except that the tips of the wing covers and portions of the legs are red.

This insect usually attacks trees which are weak and such afford excellent breeding places. But from these the beetles spread to healthy trees and often do much harm in killing the young branches in the spring by booring into the tips. Young orchard trees are more susceptible to attack than are old and vigorous trees.

The presence of the beetle is indicated by the many small holes in the bark from which more or less gum exudes. Underneath the bark there are numerous tunnels extending in all directions and which work destruction to the trees.

Control is not easy, but the most important steps to be taken are to eliminate, by burning, all badly infested trees or portions, together with all the dead wood to reduce the numbers and spread.

Healthy trees which have become infested may often be saved by thoroughly spraying the trunk and limbs with a carbolineum emulsion prepared by dissolving three pounds of naphtha soap in three gallons of boiling water, to which is then added one gallon of carbolineum. Agitate this thoroughly and dilute with four gallons of water. Sprayers must be protected, as the carbolineum is severe on exposed parts of the body.[1]

As repellents, whitewash, bordeaux paste or a thick soap wash containing one pint of crude carbolic acid to every ten gallons, may be used and afford protection to young trees. The application of any of these repellents should be made in October or November.

Besides apricots the bettle attacks the plum, pear, peach, apple and cherry.[2]

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[1]Insect Pests of Farm, Garden, Etc., by E. D. Sanderson, p. 546.

[2]Injurious Insects, by W. C. O'Kane, p. 241.

GENERAL NOTES.

THE CODLING MOTH ATTACKING WALNUTS

It is not generally known by orchardists that the codling moth often attacks the green soft-shelled walnuts on the tree. Infestations are often serious and cause considerable loss.

We are just in receipt of some nearly mature Santa Barbara soft-shell walnuts from Carpinteria, California. They were collected by C. W. Beers, Horticultural Commissioner, who informs us that the infestation is limited to an area about one half mile wide and extending along the foothills with scattering infestations along the borders of this area.

The larvæ or "worms" work near the stem end and burrow through the green hull and often into the kernel of the nut, thus causing complete ruin. Clusters are apparently preferred to single nuts.

A similar attack has been recorded as occurring in Contra Costa County on October 2, 1909, by W. S. Foster, who has given a complete account of the nut-feeding habits of the codling moth in Bulletin No. 80, Part V, Bureau of Entomology, United States Department of Agriculture, September 20, 1910. In this bulletin we are furnished the following data:

1. The codling moth, besides attacking pome fruits (apples, pears, etc.), also attacks peaches, plums, chestnuts and the following variety of walnuts: Mayette, Concord, Franquette and Parisienne. (The Santa Barbara soft-shell is now also added to the list.)
2. The larvæ work in the green fleshy hull, some never going through the shell, but the majority boring through the soft shell and feeding upon the kernel inside.
3. The worms attacking walnuts are usually of the later broods issuing from the first broods of apples and pears. They, therefore, appear late in the nuts in August and September.
4. Hibernation takes place inside the walnuts or attached to the shells on the outside. The adults emerge in April and May.
5. In Contra Costa County it was a practice of pear growers to save windfalls and culls, which were stored in trays or covered with straw. From these the adult moths emerged and laid the eggs, giving rise to the broods attacking the walnuts.
6. Destroying the culls and windfalls will greatly lessen the attacks. Spraying with arsenate of lead in August will also probably serve as a means of control.

It is also probable that in localities where little attention is paid to spraying home apple and pear orchards or trees, that there will be more or less likelihood of the later broods attacking the walnuts, as is apparently the case at Carpinteria.

Cleaning up these sources of infestation should largely eliminate serious attacks.—E. O. Essig.

RESIGNATION OF PROFESSOR H. S. FAWCETT.

Before I ever thought to occupy the important position of State Horticultural Commissioner, I had noted the alarming havoc wrought by bacteria and other fungi in some of the citrus groves of California. I wished at that early day that we might have the most able mycologist of the world to grapple with these potent pigmies—a man to camp out, so to speak, in the orchard, and fight the fight to the finish.

Upon assuming the duties of this office I hastened at once to bring to our aid the right man. I had long noted and admired the monumental work of Professor H. S. Fawcett in Florida. I can not express my sincere gratification at his acceptance of our call to this position. I felt sure we had won a prize. I need not depict to our readers how thoroughly Professor Fawcett has met our hopes and desires. The investigation by Professor Fawcett of gummosis of the lemon has proved him a master in scientific research. He has demonstrated absolutely the fungoid nature of this disease, and though he does not claim with the same confidence that he has demonstrated, that a cure is as surely discovered, yet we feel that such is the case.

Doctor G. Harold Powell states that four epoch-making events in the history of our California citrus industry have occurred: Introduction of the navel orange; establishment of co-operative marketing; method of preserving the lemon, and discovery of cause and cure of gummosis, by Professor Fawcett. I would add Doctor Powell's own work of demonstrating efficiency, of careful handling to prevent decay in shipping citrus fruit, and the introduction of Vedalia.

I felt sure that Professor Fawcett was just the kind of a man that Doctor Webber would desire in the citrus station in southern California. I knew that his opportunities in the University would be augmented. I also felt, with Doctor Hunt, that Professor Fawcett's work was really that of the University. I therefore proposed to Doctor Webber that if he desired, Professor Fawcett might be transferred to the University staff of workers. I only asked that he be retained in the precise field of labor that has engaged his efforts in this Commission. This secured the happy blending of practical field work, and the necessary attendant research service. Both Doctor Hunt and Doctor Webber were pleased with this suggestion, and the transfer was made.

I have only to add that Professor Fawcett is as delightful and companionable as a man as he is able as an investigator. He is honesty itself; like all really great men, a model of modesty, an untiring worker. He has endeared himself to us all. It is with very great reluctance that we are to part company with our esteemed fellow-worker—A. J. Cook.

A NEW BEGINNING IN THE IMPORTATION AND ESTABLISHMENT OF BENEFICIAL INSECTS.

The mission of H. S. Smith, Superintendent of the State Insectary, to the Orient, in search of beneficial insects, is of very great importance to the farmers of this State, and renewing a common-sense policy of fighting insect pests inaugurated in this State in 1887, by the first intro-

duction of the Vedalia from Australia, and which saved to California the great citrus industry.

Comparatively speaking, there are very few persons in the State at the present time who witnessed the downfall of the orange and lemon groves under the attack of the cottony cushion scale (*Icerya purchasi*) from 1885 to 1887, and it might be of interest to the present-day readers to again publish what the Los Angeles poet, Mr. Kercheval, once wrote about the ravages of the cottony cushion scale:

"More deadly than the hordes of Goths and Huns that came to plow Rome and harrow Italy, came the countless legions of Icerya, and shriveled foliage and bare and blasted boughs everywhere told of their resistless and ruthless march. No watchfulness or vigilance could guard against their attacks, or turn them from their victorious course. Then in the deep night of our despair came a miracle and relief. As silent and noiseless as came the Angel of Death to smite the Assyrians beleaguering God's chosen people so came the Vedalia to our aid, and like Sennacherib's countless hosts, the cottony cushion legions, almost in a night, melted away and were no more. What a vast army of men and millions of dollars could not have performed in years, a mere handful of Australian ladybugs has virtually accomplished in a few weeks, and even to us, who have watched their work most closely, it seems utterly incomprehensible, and almost beyond belief."

That there exists in the Orient the various scale insects which are such serious pests in some sections of this State to citrus culture has been proved beyond question, and not a single species is a pest in that region—the red, purple, black scale and the citrus mealy bugs all being held in complete subjection by natural checks—and there is no good reason why we should not be able to transplant and establish some, if not all, of these natural checks into this State by a man of Mr. Smith's ability.—George Compere.

A NEW PARASITE OF THE BLACK SCALE.

The importance of a parasite of the black scale, *Saissetia oleæ* Bern., which will destroy the immature form, can not be overestimated.

Scutellista cyanea, the egg parasite of the black scale, which is so common, does not hold the pest in check for two main reasons: *first,* that the larva of the parasite reaches maturity in many cases without destroying all the eggs of the host, thus permitting enough of the young scale to escape to reinfest an orchard, even if one hundred per cent of the scaled showed the exit holes of the parasite; *second,* that the percentage of parasitism of the black scale by *Scutellista cyanea* rarely averages above eighty or eighty-five per cent. From these facts it can be easily seen why the black scale remains a pest year after year in our groves. Also, the percentages of parasitism is lessened by other factors, as secondary parasites, humidity, temperature, etc. Moreover, the efficiency of the *Scutellista* can only be judged by its capacity in reducing the progeny of the scale. The young scales hatch and will cause great injury to the host by sucking the sap and will have secreted all the honey-dew on which the black smut lives before the parasite has its inning.

The State Insectary has been in the past and is now making every effort to secure and establish a parasite which will kill the immature scale. On August 19th, through the kindness of Mr. H. A. Ballou of the Imperial Department of Agriculture of the West Indies, we received a small shipment of half-grown black and hemispherical scales parasitized by *Zalophothrix* sp., which is not unlike our own *Comys fusca*, the parasite of the brown apricot scale, in habits. We have now on hand a number of adults of *Zalophothrix* and an attempt will be made to establish them in California.—E. J. Vosler.

MELANOSE (Stem-End Rot).

Melanose, a common disease of nearly all varieties of citrus fruit in Florida, though not yet in California, is now discovered to be caused by the same organism that produces the serious affection, Stem-End Rot (Florida Bulletin No. 111). Melanose is characterized by small black dots ringed with white, the rings invisible to the naked vision. In itself it does no harm except a slight disfigurement. Stem-end rot attacks the mature, or nearly mature, fruit in the grove, in storage or after shipment. As it destroys all our common varieties of citrus fruit, we should try in every way to keep it from California. This is why we bar out all Florida fruit that shows Melanose. Of course, we are most menaced by grape fruit, as no other is likely to be shipped into our State. All of our county horticultural commissioners must be on the lookout for Melanose, and should at once learn to detect it, in case this fungus comes into any of our citrus districts.—A. J. Cook.

ARIZONA COMMISSION OF AGRICULTURE AND HORTICULTURE.

PRESS CIRCULAR NO. 4. FEB. 8, 1913.

Arizona Inspection Practices Relating to Crown Gall.

Nearly all deciduous fruit growers are familiar with the tree disease known as "crown gall." This trouble is caused by a bacterial organism which attacks a great many different trees and plants, causing various types of abnormal growths. In some cases the crown of the trees or the roots develop large, more or less rounded, hard galls; in other cases the galls are more irregular in shape, and soft; in still others the infection results in a soft, flattened, callus growth, from which many fibrous roots develop, producing the effect commonly known as "hairy root."

Crown gall is not ranked as a necessarily fatal disease of fruit trees. It is known to vary in the degree of its injuriousness under different conditions. In Arizona many bearing deciduous fruit trees have been destroyed or rendered unprofitable by this disease and all of the best authorities are agreed that under all conditions nursery stock affected with it should be discarded and never planted. Crown gall affected trees are commercially worthless and all reputable nurserymen endeavor

to avoid including diseased stock in filling their orders. Crown gall disease is prevalent in all parts of the country and is believed to exist in most deciduous fruit nurseries.

Under the provisions of the original inspection law in Arizona, our work was confined to insect pests, and we had no authority to prevent the delivery of trees or plants infected by plant diseases. Under the amended "Crop Pest law," however, action against diseased plants is authorized. The need for this is strikingly shown by a recently inspected shipment of nursery stock to Safford, Arizona, from a nursery in Portland, Oregon. This shipment included 3,000 apple trees, and the inspector's report showed that crown gall affected trees were found in every bundle of trees throughout the lot and that one bundle of ten trees included five infected specimens. Five examples sent to the writer's office showed the disease in a most pronounced and unmistakable form. The consignees did not need to be informed concerning the worthlessness of the diseased trees, and according to their estimate, one fifth of the entire lot of 3,000 trees were visibly infected.

The significance of this outrageously large proportion of worthless trees included by the shippers is indicated by the proportion of diseased trees normally present in honestly sorted nursery stock shipped into this State. It is admittedly practically impossible to prepare a large shipment of deciduous nursery stock and eliminate all trees visibly infected with crown gall, if the disease is present in the nursery. Nevertheless, the inspection of many carloads of deciduous fruit stock from reliable western nurseries has resulted in finding less than one tenth of one per cent of the trees visibly infected by this disease. A representative of a well known Oregon nursery recently called at the writer's office and upon being shown the five specimens of diseased trees from the Safford shipment, referred to above, stated that he would be willing to guarantee a customer against as many typical crown gall infected trees in an entire car lot. In a car lot of ten thousand trees, this would represent one twentieth of one per cent. At the rate the infection was found in the Safford shipment, however, there would be two thousand visibly infected trees in a car lot of ten thousand.

If we credit the shippers with having made an honest effort to separate out the worthless diseased trees before shipping the order, we are forced to conclude that the sample of their stock shipped to Safford is quite free from the disease as compared with the average stock in the nursery from which the stock was selected. We must also conclude from the sample sent to this State, that the incipient infection among the trees not visibly diseased is at least 200 times as abundant in proportion in shipments such as this, with 20 per cent visibly infected, as in shipments showing only the normal degree of infection, or less than one tenth of one per cent.

The Arizona law gives specific discretionary powers to the inspectors acting under the directions of the State Entomologist. If crown gall was not known to exist in the State, the writer would not hesitate to insist that shipments be absolutely free from visible crown gall infection, and to recommend to the Commission of Agriculture and Horticulture quarantine regulations which would restrict the danger of importing the disease. Since it already exists here, however, we can

only prevent the unnecessary spread to uninfected soils and prevent losses to planters from planting and caring for visibly infected trees. From abundant experience it has been determined that an allowance of one per cent of stock visibly infected with crown gall in an imported shipment, is fully ten times as much as reliable nurserymen need as a margin against unavoidable oversights. On the other hand, it is of advantage to the fruit interests of this State to have the allowance placed as low as possible. Shippers will be less likely to make their selections from grossly infected lots of stock, the proportion of incipiently diseased stock will be, on the whole, greatly reduced, and incidentally Arizona customers will not be forced to pay the transportation charges on an unreasonable proportion of diseased trees.

In consideration of the facts above presented, with the desire to meet the needs of both the shippers and importers, the writer has, under date of January 31, 1913, issued the accompanying instructions to Arizona crop pest inspectors.

A. W. Morrill, State Entomologist.

INSPECTION ORDER NO. 3.

Crown Gall.

Since "crown gall" is of common occurrence in all parts of the country, occurring in practically all nurseries, particularly in the west, since this disease is already prevalent in Arizona, and since it is impossible by means of inspection to entirely prevent further introduction of the infection, *one per cent* is hereby established as the maximum degree of infection to be passed by Arizona crop pest inspectors. If more than one tree in a hundred of a kind (apple or peach, for instance), is plainly infected with crown gall, *all* of that kind will be rejected and not released. Such other kinds of trees or plants as may be in the same shipment, but do not show crown gall infection to exceed one per cent, will be released. Every tree or plant showing crown gall disease will be discarded. If the shipment, or any kind of plant or tree comprising the shipment, shows infection in excess of one per cent, samples, selected in the presence of the consignee or some other person, if possible, will be submitted to the office of the State Entomologist, and the remainder of the diseased stock held for advices from the owner as to option specified in section 15, crop pest law of 1912. If one per cent or less of the shipment, or any kind of plant or tree contained therein, is found to show crown gall infection, all diseased and suspected stock must be burned, as a condition of the issuance of the release for the balance of the stock.

For the protection of the consignee, trees that are "strongly suspected" of crown gall infection will be discarded at the time of inspection, but in figuring the percentage of trees infected when the amount is close to one per cent, none but well developed and characteristic infections will be counted. Roughened draft unions should not be counted as crown gall infections unless the development of "callus" at that point is excessive as illustrated in Bulletin 186 (Plate VIII, fig. 2) of the Bureau of Plant Industry, United States Department of Agriculture. Whenever a shipment of any kind of tree, vine or plant in a shipment shows well defined crown gall infection in excess of one per

cent of the stock, such stock will not be reshipped or destroyed on account of crown gall infection until samples have been passed upon by the State Entomologist or Assistant State Entomologist.

A. W. Morrill, State Entomologist.

Phoenix, Arizona, January 31, 1913.

THE POTATO TUBER MOTH.

Suggestions to Potato Growers and Shippers.

The potato tuber moth is causing much anxiety in the states of Oregon and Washington, where the pest has not yet become estab-

Fig. 365—Cross section of potato showing the work of the potato tuber moth.

lished. All possible measures are being adopted to prevent further spread of the insect within and without California. In as much as

spread is usually through the transportation of infested potatoes, all growers and shippers in the infested areas of this State should take every precaution to see that not a single infested potato is allowed to be shipped either to points within or without the State. It is feared that if our growers do not heed this, that it will not be long before some states take action to prevent the shipping of all California potatoes, which will mean a great loss to commercial potato growers.

For the protection of the potato growing industry of California, growers should procure seed potatoes from districts known to be entirely free from this pest. All seed should be thoroughly inspected just before planting to be sure that obscure infestations have not developed in storage.

It is sincerely hoped that all public horticultural officials, growers and shippers will work to the end that no infested potatoes be allowed to be shipped or planted.—E. O. Essig.

MONTHLY CROP REPORT—AUGUST.

These data are compiled by the secretary from monthly crop reports made by the county horticultural commissioners. Counties not included have not reported or the reports have come too late for press. Unless otherwise designated, percentages refer to last year's crop.

The report for August is brief because many of the crops have already been harvested. Conditions have remained unchanged in many counties. Reports from only sixteen counties have been received.

The conditions throughout the State have changed very little with respect to former estimates. The early frosts and continual hot weather have caused a shortage of most fruits and many have been damaged by sunburn. Good prices, however, are helping the growers to realize almost as much from their crops as during normal producing years.

Prospects for citrus fruits still remain about the same as reported in July, although there have been slight droppings in some of the interior districts in the Sacramento Valley.

INSECT NOTES.

The potato mealy bug, *Pseudococcus solani* (Ckll.) has been recently reported from San Joaquin County feeding upon the underground portions of the potato stalks. This insect also feeds upon the roots of nightshade, malva and pigweed and occurs in many parts of southern California. So far, however, it has not proven a pest.

The cottony cushion scale, *Icerya purchasi* var. *crawii* Ckll., has been sent in by Charles W. Weeks from Red Bluff, where it occurs on acacia. This light-bodied variety is usually much larger than the dark-bodied variety *maskelli*.

The confused flour beetle, *Tribolium confusum* Duv., has been reported in the granaries of Glenn County by Commissioner Carl Ley.

The orchard mite, *Epitrimerus pyri* Nal., has been reported from a number of localities in San Diego County, where it was first observed by Geo. P. Weldon.

The branch and twig borer, *Polycaon confertus* Lec. Commissioner Earl Morris of Santa Clara County reports the prune as a common host of this beetle in his county.

A dark blue blister beetle, *Cantharis stygica* Lec., has been reported as doing serious damage to lilac bushes in Modoc County by Commissioner O. C. McManus. Last year the same beetle did considerable damage to various ornamentals in Lassen County.

The jumper louse, *Lachnus juniperi* Del G., has been collected this month at Ventura, California, by S. H. Essig, who reports it working upon *Thuya* sp.

The squash bug, *Anasa tristis* De Geer, is reported as being present in many localities of Placer County, according to the report of Commissioner H. H. Bowman.

The hop aphis, *Phorodon humuli* Schrank. Mr. E. J. Branigan has returned from Towles, Placer County, where he collected approximately 3,000,000 *Hippodamia convergens* Guer. These are being used by County Commissioner Bloomer to combat the hop aphis.—E. J. Vosler.

The red-humped caterpillar, *Schizura concinna* S. & A., is doing minor damage to walnut trees in Yolo and Sacramento counties.—E. J. Vosler.

Herrn. F. Wichgraf, president of the Entomological Society of Berlin, to whom 30,000 live specimens of *Hippodamia convergens* Guer. were shipped by the State Commission of Horticulture some time ago, informs us that the shipment arrived in fine shape and he thinks that the beetles will be of much benefit in destroying the plant lice injurious to crops in Germany.—E. J. Vosler.

NOTES FROM THE COUNTY COMMISSIONERS.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

Butte County.

Mr. Earl Mills informs the office that the report in the last Monthly Bulletin that black scale occurs in commercial olive orchards in his county is wrong. He states that black scale does not occur in a single commercial orchard.

Humboldt County.

Geo. B. Weatherby is making arrangements for a series of meetings among the fruit growers early in September. Professor Van Normen, Dean of the University Farm School at Davis, and Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture, are to address these gatherings.

Kern County.

K. S. Knowlton is conducting a vigorous campaign against the Russian thistle in his county.

Lake County.

Mr. G. A. Lyon, Horticultural Commissioner of Lake County, reports heavy planting of trees the past season. Bartlett pears are the main crop. They are netting the growers $32.00 per ton this season in spite of the fact that there are no railroad facilities and the nearest shipping point is 25 miles distant.

Mendocino County.

Mr. J. R. Banks, County Horticultural Commissioner of Mendocino County, has deputized Mr. E. M. Dutton, who graduated from the University of California, class of 1913, to help him in his work. The apple crop of the county is reported short for the season. Bartlett pears are fairly good and are bringing a good price.

Modoc County.

O. E. McManus, of Alturas, writes that pear blight is abundant in his county.

Stanislaus County.

A. L. Ruthford reports a milliped injuring lawns in the vicinity of Modesto.

Sutter County.

County Commissioner Stabler of Yuba City has issued a circular giving instructions for the use of the flour paste spray in controlling red spider on beans. This pest has been doing considerable damage of late in bean fields of Sutter County. Mr. Stabler's method of publishing and sending out specific information at the opportune time to those who are interested in some problem of insect control is to be commended.

QUARANTINE DIVISION.

COUNTY HORTICULTURAL COMMISSIONERS AND STATE QUARANTINE GUARDIANS.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, Cal.

The writing of the monthly record of the quarantine division has never, so far, furnished as much real pleasure to the author as the one herein set forth. The spontaneous, voluntary agreement of the county horticultural commissioners made at Sacramento, to henceforth work in harmony with the State Office has made possible the consummation of a long and ardently desired policy on the part of the executive head of the quarantine division. This department deals directly with county horticultural commissioners in so far as their functions as state quarantine guardians are concerned, or more directly speaking, in the matter of horticultural material arriving within the territory under their jurisdiction from outside the State boundary.

The establishment of a uniform policy and procedure in the matter of executing interstate quarantine regulations in each and all of the protected counties similar to those in vogue at all of the stations of the coast division will greatly increase the respect of future shippers for our insistent demand for clean nursery stock and create a general appreciation of the fact that the horticultural statutes of California were enacted with the intention that the same should be obeyed.

A full measure of recognition has been accorded to the coast division of the state quarantine service for their efforts and results, and it is the earnest desire of the writer that this shall extend to the entire interior division of the service. Every state quarantine guardian is a member of the quarantine division, and the complete working in unison of all concerned will cement together an impregnable wall of protection, through or over which no infected shipments can pass, and whatever good results to the State at large, the same will redound to the individual credit of each member of the entire division. What the central office at San Francisco needs to bring about this desired condition is prompt information of the receipt of imported horticultural products at interior points each month. In return for this collaboration, the central office stands ready to furnish advice—and assistance if needed—drawn from the great amount of material and information at its command concerning the insect pests and their host plants of the world at large, and the State regulations that govern their introduction.

REPORT FOR THE MONTH OF JULY, 1913.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer.

SAN FRANCISCO STATION.

Horticultural imports—

		Parcels.
Ships inspected	40	
Passed as free from pests		38,012
Fumigated		1,793
Destroyed or returned		306
Contraband destroyed		28
Total parcels horticultural products for the month		40,139

Horticultural exports—

	Parcels.
Inspected and certified	837

Pests Intercepted.

From Honolulu—
Diaspis bromeliæ and *Pseudococcus* sp. on pineapples.
Aphis sp., *Coccus hesperidum* and *Pseudococcus* sps., on betel leaves.
Cylas formicarius and *Cryptorhynchus batatæ* in sweet potatoes.
Hemichionaspis minor on tea plant cuttings.

From Japan—
Leucaspis japonica on maple.
Aphis sp. on pine.
Pulvinaria sp. on plant.

From Guatemala—
Caulophilus latinasus in avocado seeds.
Bruchus sp. in beans.

From Central America—
Chrysomphalus biformis on orchids.

From New York—
Pseudococcus sp. on begonia.

From Tahiti—
Lepidosaphes beckii on oranges.

LOS ANGELES STATION.

Horticultural imports—

		Parcels.
Ships inspected	22	
Passed as free from pests		32,080
Fumigated		165
Destroyed or returned		11
Contraband destroyed		--
Total parcels horticultural products for the month		32,256

Pests Intercepted.

From Algeria—
Parlatoria blanchardii and *Phœnicococcus marlatti* on date palms.

From Connecticut—
Pseudococcus sp. on gardenias.

From Florida—
Lepidosaphes beckii and *Melanose* on pomelo.

From Illinois—
Orthezia insignis on unidentified plant.

From Mexico—
Coccus hesperidum on palms.
Heilipus lauri in avocado seeds.

From New Jersey—
Chrysomphalus dictyospermi, *Coccus hesperidum*, *Diaspis boisduvalii*, *Eucalymnatus perforatus* and *Pseudococcus* sps. on orchids.
Coccus hesperidum and *Pseudococcus citri* on acacia.
Pseudococcus citri on dracena palm.
Pseudococcus citri on *Hibertia* sps.
Pseudococcus citri on *Ficus utilis*.

From Pennsylvania—
Aspidiotus hederæ on Kentia palms.

SAN DIEGO STATION.

Horticultural imports—

		Parcels.
Ships inspected	30	
Passed as free from pests		6,296
Fumigated		1
Destroyed or returned		4
Contraband destroyed		7
Total parcels horticultural products for the month		6,308

Pests Intercepted.

From Japan—
Pseudococcus sp. on dwarf pine.
Aspidiotus sp. on rose bush.

From Ohio—
Pseudococcus sp. on shipment of miscellaneous plants.

From Mexico—
Orthezia sp. on *Jasminum* sp.
Hemispherical scale and black scale on *Jasminum* sps.

SANTA BARBARA STATION.

Ships inspected ---------- 1
No horticultural imports.

EUREKA STATION.

Ships inspected ---------- 5
No horticultural imports.

THE SEBASTOPOL GRAVENSTEIN APPLE SHOW.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

Sebastopol has become famous, not only in California, but throughout the apple-growing sections of the United States, because of her annual Gravenstein show, thus furnishing a splendid illustration of what enterprise and united effort will do toward building up the reputation of a community.

The Gravenstein.

This one variety has been responsible for much of the fame that has come to the section of California adjacent to Sebastopol where it is grown, not necessarily because this particular variety of apple is the best that there is, but because it has been grown extensively. Instead of a great many varieties, we find this to be the one which is grown almost exclusively, and as a consequence such splendid shows as the one recently

Fig. 366.—Prize winning box of Gravenstein apples, Sebastopol Gravenstein Apple Show. (Original.)

held are possible, and not only is this true, but it also follows that a good market is assured. The Sebastopol section is adapted to the growing of this splendid apple; there it seems to be in its element, and an intelligent community has taken advantage of this fact, uniting their efforts towards the production and perfection of this one variety.

Other sections of California, and of other states, have specialized also, and we think of Watsonville in connection with her Yellow Newtown Pippins and Yellow Bellflowers; Hood River, Oregon, has been made famous by her Spitzenbergs, and so we might name a great many cases of success in the apple world due to specializing in the growing of certain well-adapted varieties.

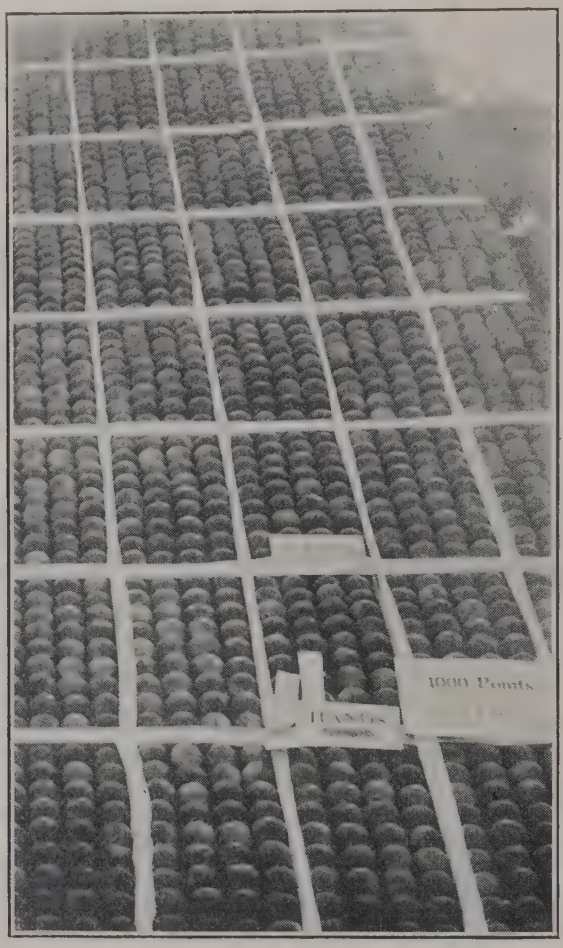

FIG. 367.—Prize winning Alexanders, Sebastopol Gravenstein Apple Show. (Original.)

Lesson to Other Sections.

Other sections may not be able to grow the Gravenstein, the Yellow Newtown, the Yellow Bellflower, or the Spitzenberg successfully, but there may be still other equally as good varieties that will grow to perfection. The time has passed when the orchardist can grow a miscellaneous lot of varieties, a little of this and a little of that, and succeed from a commercial standpoint. In the early days of orcharding in California, this was done, partly because it was not then known what varieties would do the best, and partly because an unlimited market was at the disposal of all. In this day of keen competition in the fruit business, it is necessary to produce the best and in sufficient quantity to be able to dispose of carload lots of one variety. Recently, the writer visited certain sections of the State where each man who grows apples is trying to succeed with a great many varieties, caring not what his neighbor may be growing. With the lesson of Sebastopol before us,

is it not time for such people to get together, agree on some good variety or a few good varieties, and plant them to the exclusion of everything else? Not until this is done can it be hoped to compete with sections such as those already named.

Educational Value of the Show.

The thousands of visitors who went through the exhibit tent must surely have carried away with them something in the way of new ideas. Exhibit after exhibit of well selected Gravensteins; carefully prepared and expensive feature displays made from the same kind of apples, must have brought to them the significant fact that the Gravenstein made the show possible. To the orchardists, even those who had been successful from a financial standpoint, there were many lessons. It was said that never before has so good a pack been seen at the Sebastopol show. Fruit must be well cared for in the orchard, well selected and well packed, to receive a perfect score at the hands of competent judges. Such fruit was on exhibition this year, indicating that some had learned the lesson that worm-specked, scabby, poorly packed fruit, lacking in color and uniformity, would not score well and could never gain a premium in competition with well selected, well packed fruit free from blemishes, such as is shown in Figs. 366 and 367.

Lesson in Better Care of Orchards.

The effect of such a show relative to the general care of the orchard can scarcely be estimated. Pruning, cultivating, spraying, and thinning are all necessary for the best development of apples. Show fruit, such as was seen at Sebastopol, can only be grown when the proper attention has been given to some of these important phases of orchard management. A discount of 40 points for a wormy apple made it necessary for very careful selection of the fruit, in order that none of it might be found infested with the codling moth. While some may look upon such a discount as unjust, it is certainly valuable in that it teaches the lesson that wormy fruit is undesirable; that the buyer, when he goes through a box of extra fancy stock, does not want to find a single worm. Codling moth can be controlled effectively by proper attention to spraying, and such being the case, there is little excuse for wormy fruit being exhibited. Greater uniformity and better color will result from proper pruning and thinning. Cultivation along with spraying should practically eliminate scab. All these things were no doubt brought to the mind of the orchardist who looked over the exhibit and who would make the most out of his fruit.

Sebastopol deserves to be congratulated upon the splendid showing made. From an advertising standpoint she has been eminently successful; the educational value can never be estimated, but it is safe to say that the future will profit greatly because of the quality of the exhibits and the care exercised in their display. From an æsthetic point of view there was much to charm. Fig. 368 gives some idea of the amount of work that was necessary to prepare the feature exhibits which were a credit to any community.

FIG. 368.—Some of the feature exhibits of the Sebastopol Gravenstein Apple Show. (Original.)

THE GUNWORM OF THE GRAPE.

(*Sciopteron regale* But.)

Order—Lepidoptera. Family—Sesiidæ.

By Frederick Maskew, Chief Deputy Quarantine Officer.

The phase of quarantine work that deals with the personal belongings of the globe-trotting passengers who arrive at the port of San Francisco is a never ending drama, replete with side-lights on the various whims, fancies and idiosyncrasies of these peregrinators, as expressed by the articles that have attracted both their interest and coin in some of the ports they have visited, and to which, as yet uncloyed by possession they attach the greatest of value. Strictly within his own domain, the quarantine officer's sense of uniqueness or oddity is dulled by familiarity and his acquaintance with the tricks of Oriental gardeners. His chief interest is in the insects that have usually escaped the attention of the owner of the material. With the quarantine officer all insects are—at least potential—rascals. The beauty and grace of their structure or covering makes no impression; even as Dickens, in his own inimitable way, depicted the dominating influence an occupation has upon the point of view, when he described the public hangman as unable to see any feature in a gathering of celebrities other than the caliper of their necks. So with the quarantine officer: even a strange coccinellid found on an importation, brings a frown of suspicion. The many virtues possessed by the numerous species of this family are overshadowed by the vices of one black sheep. *Epilachna* obliterates *Novius* for the time being, and on general principles the specimen, together with its host, is taken in and kept in, until its general behavior can be vouched for.

In this particular instance, a passenger, a man of much wealth and abundant leisure, was bringing from Yokahama a number of song birds to enrich the collection in his large aviary at Cleveland, Ohio. Even the most hardened of quarantine inspectors had no objections to this, but, herein lies the tale. He had brought also a sack full of small cuttings of some species of vine—"just a little bird food"—was the casual way he indicated what the sack contained, and it was patent to all who heard, that he was innocent or ignorant of any potential danger in the material. However, seeing that the contents of the sack were something that had grown out of the soil, it must of a necessity be carefully examined. Look at Fig. 369, an actual photograph of a portion of the material. It did not require a trained inspector to see that these twigs were abnormal; the swellings would indicate the presence of some thrifty tenant; a touch of the knife revealed the true condition; a yellow, plump, greasy larvæ of a sesiid borer that had grown fat on the living tissues and vital forces of these vines, and which in turn was destined to fatten this lot of songsters in transit to Cleveland. The future of California's vineyards immediately took precedence of ornithological menus or melodies; the possibility of an infested twig or two being dropped while the material was in transit through the State, was considered of greater importance than a hungry songster, so the entire lot was confiscated, much to the chagrin of the owner, who did not need

FIG. 369.—Work of the gunworm of the grape on material taken in quarantine by the author. The holes and swellings are the result of the insect's work. (Photo by Chatterley.)

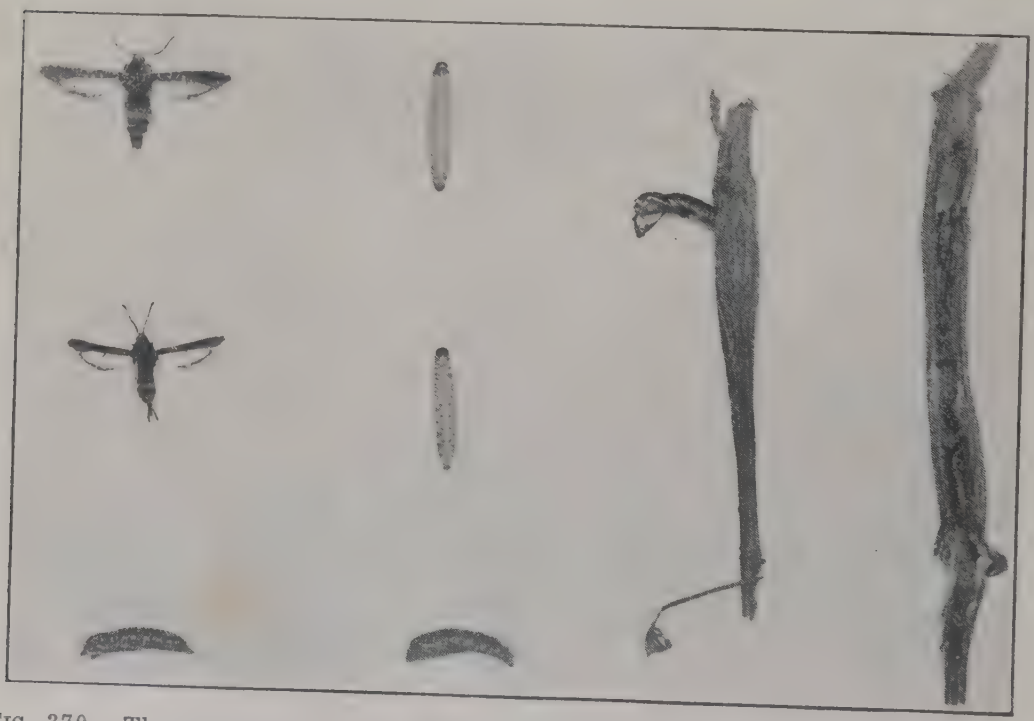

FIG. 370.—The gunworm of the grape, *Sciopteron regale* But., showing work on vine, larvæ (in middle), pupæ (at bottom), and adult moths. Reduced about one half. (Photo by Chatterley.)

the present annual returns from some vineyard to enable him to meet the ever increasing cost of living.

From this material was taken the different samples of the destructive work illustrated in this article, together with the specimens of several life stages of the insect (Fig. 370), which have been described by E. O. Essig, as follows:

Larvæ.—The matured larvæ vary from three fourths to one inch in length and from three tenths to two fifths of an inch in diameter.

The color is yellow with feet and head dark rich brown and the prothoracic plate light brown. The spiracles are also brown. There are two distinct rows of deep yellow spine areas on the dorsum—four areas to each abdominal segment; a row on each side of the spiracles; a row in line with the spiracles and which do not appear to bear spines, and a row just above the legs on the sides. Nearly all of these areas bear a single slightly curved brown spine, though on the dorsum of the pro- and mesothorax there are usually two spines to an area. Similar spines also occur around the bases of the prolegs and on the head, prothorax and tip of the posterior end.

There are three pairs of true legs, four pairs of prolegs, just back of the middle, and one pair of prolegs at the extreme posterior end. The tips of these legs are brown.

Pupæ.—The pupæ or chrysalids are rich amber brown throughout in color and average about three fourths of an inch in length.

Adult.—The average length of the adult moth is three fourths of an inch, the wing expanse being about one and one half inches. The general color is orange and black with a hue of iridescent purple. The head is orange with the bases of the palpi and eyes black—the tips of the palpi being orange. The antennæ are dark iridescent purple, becoming somewhat brownish towards the tips. The thorax is black with orange spots at the bases of the wings, two similar spots on the sides of the prothorax just behind the head, and an orange band across the dorsum, and two orange spots on each side of the metathorax at the bases of the hind wings. The legs are black with light orange markings on the coxæ and other joints. The forewings are entirely opaque, covered with brown and orange scales with a pinkish iridescense. The hind wings are transparent with brownish-yellow borders. They are also iridescent. The abdomen is velvety black, appearing purple under certain side lights. There are several inconspicuous and two prominent orange bands; the widest being near the middle and the second widest being near the tip. The tuft at the tip is black.

In Japan this insect is known as the "Budoo-no-teppoo-mushi," meaning "gunworm of the grape." The larvæ bore into the canes of the grapevines and are very destructive to viticulture in that country.

MORE IRRIGATION.

By A. J. Cook, State Commissioner of Horticulture.

One of the finest and most profitable deciduous fruit orchards of California is situated close beside the banks of the Sacramento River. For years this grove received no water other than that which came from the annual rainfall; even then the profits were large. A few years ago a centrifugal pump was installed, by aid of which abundant water was drawn over the levee from the river. Since that time, just prior to the picking season, the orchard is thoroughly irrigated. The profits since have increased from one third to one half. Two years ago the receipts from the seventy acres exceeded $40,000. Last year nearly two thirds as much profit was received. This year the returns have exceeded those of any previous year. The owner feels sure that the present crop is much improved in quantity and quality, while probably the greatest advantage comes from added vigor and stimulus which secures more and finer fruit buds. This experience, as given above, has a lesson for every fruit grower of the State.

More Water Available.

Of course such streams as the Sacramento, American, Feather, San Joaquin, etc., are all too restricted in their distribution, yet these in their location are not utilized to anything like what the best success of the farmers demand, but there is an almost inexhaustible supply in the underground reservoirs in nearly all parts of the State. Wells sunk into these sub-earth gravels are often artesian and even, when not flowing, with our cheap electric energy, pumping is not so expensive as to be prohibitive, but will generally pay a large per cent on its cost. I believe that soon the increase in profit in very many of our fields and orchards, through a more generous supply of water will equal those referred to above.

This present season in the county of Sacramento, there has been an excessive drop of oranges in some of the groves. It is true that some dropping of fruit is to be expected and is even desirable. It is nature's way of thinning the fruit, and lessening the overstrain of the trees. Sometimes this thinning is over done and considerable loss occurs. In parts of this and other northern citrus counties, this dropping is excessive in some of the orchards this season and loss will result. There is, however, compensation, as the trees will profit by the release from full or over production and will be in better condition for service next year. The evident cause for this overdrop this present season, in some cases at least, is lack of water. The curled leaves prove this beyond conjecture. Indeed, some of the orchards are thirsty, and possibly chronically so. It would be the height of wisdom to plan at once for more water. In usual seasons the water is all too limited in amount; in seasons of extreme heat, like the present, any lack of moisture is very likely to become serious. Great heat with plants, as with animals, is not serious—with plants is really advantageous—if abundance of water is in the sap or blood; but in its absence, great danger, often fatality, results.

The obvious conclusion from the above fact is, provide for and use

more water. In case a perennial stream is near by, utilize this advantage to the utmost; in its absence, study your locality to learn if you have artesian water, or water in the underground reservoirs that may be pumped, and prepare as soon as possible to secure for all your crops sufficient moisture for the best production at all times, and especially during seasons of excessive heat.

In the few cases where extra water is impossible, we may still hope with our favorable soil and climate and the best cultivation, to secure ample crops of grain and of some deciduous fruits.

THE WESTERN TWIG BORER.

(*Amphicerus punctipennis* Lec.)

Order—Coleoptera. Family—Bostrychidæ.

By E. O. Essig, Secretary State Commission of Horticulture.

Since publishing the article on the branch and twig borer, *Polycaon confertus* Lec., in The Monthly Bulletin, Vol. II, pp. 587-589, July, 1913, the writer has received twigs of apricot trees showing similar but more severe attacks of an insect with inquiries as to the cause. In this instance, the burrows were much longer than those made by the branch and twig borer, and the attacks much more damaging to the twigs. Specimens of the beetle causing the injuries were taken from the burrows and sent to Mr. Charles Fuchs of the California Academy of Sciences, who determined it as *Amphicerus punctipennis* Lec.

It is the aim of this article to give simply the data at hand, in order that others may recognize the insect and send it to this office with all data relative to it, in order that we may make a more thorough study of the life history, distribution, food plants, destructiveness, and control for future publication.

Work.

The work of this beetle greatly resembles that of the branch and twig borer, and may often be mistaken for it. The burrows are usually made at the axils of a bud or in a fork (Fig. 372), but this is by no means as common a characteristic as with the former, as is shown in Fig. 371. Here the burrows are made irrespective of any particular place on the twigs. The burrows vary from one to three inches in length and are about one eighth of an inch in diameter. The smaller twigs are either so weakened by the short burrows that their weight causes them to break, or they are completely hollowed out by the long burrows so that they simply hang by the bark and dangle from the tree. The tunnels are usually partially filled with the frass made by the beetles, and the entrances are ofen sealed with a large globule of gum which has been produced by the injury. (Fig. 372.)

Apparently the beetles bore into the twigs for food and protection and not to deposit eggs.

Damage.

From what is known of this species, it appears to prefer dead or dying wood to breed in. D. W. Coquillett first bred it from dead fig twigs and later from dry canes of grape. Dr. Edwin C. Van Dyke has

FIG. 371.—The work of the Western twig borer, *Amphicerus punctipennis* Lec., on living twigs of apricot tree. Twice enlarged. (Original.)

FIG. 372.—Gum globules formed over the entrances of burrows made by the Western twig borer, *Amphicerus punctipennis* Lec. Twice enlarged. (Original.)

bred the beetles from mesquit cord wood and believes that in all probability they would attack living trees if in an unhealthy condition. He further states that "there is no doubt, however, that they could do a great deal of harm to woodwork in the Southwest, particularly if the wood was mesquit, acacia or any wood that was to their liking."[1] In the early part of September Mr. B. R. Jones, Deputy County Horticultural Commissioner of Los Angeles County, sent in twigs of apricot trees which were seriously injured by these beetles and which contained four living adult beetles at work in the burrows. He stated that many burrows were made at the crotches of the trees and were filled with gum. He does not state that the affected trees are in poor condition,

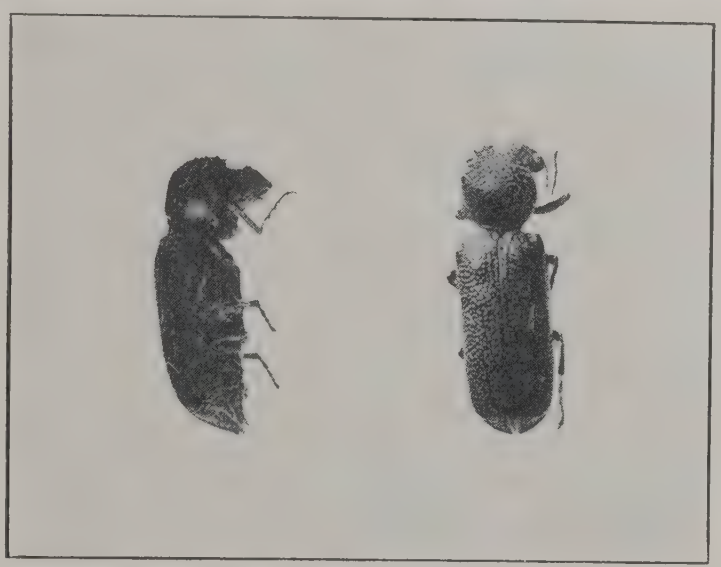

FIG. 373.—Adult female of the Western twig borer, *Amphicerus punctipennis* Lec. Dorsal and side views. Twice enlarged. (Original.)

and the writer infers that they were in a normal, healthy state. Mr. Jones further states that should the attacks become common in an orchard, much damage would be done.

Slight attacks of the beetle are reported by Mr. Geo. P. Weldon on pears in Humboldt and San Joaquin counties.

From all the data at hand, it does not appear that the attacks of this beetle are either serious or common. In the view of ascertaining these points, it is sincerely hoped that all occurrences and attacks will be reported to this office.

Appearance and Life History.

The adult beetles (Fig. 373) are dark brown, with feet and other portions of the body clothed with fine yellowish-brown hairs. The head is held at right angles to, and directly beneath the prothorax. The front of the prothorax is covered with many distinct tooth-like projections, which make this beetle easily distinguishable from the branch and twig borer. The wing covers are coarsely punctured and consequently very rough.

[1] In letter dated Berkeley, Cal., Sept. 26, 1913.

This beetle differs from the Eastern apple twig borer (*Amphicerus bicaudatus* Say) in being larger.

Regarding the life history, Dr. Edwin C. Van Dyke, Department of Entomology, University of California, under date of September 26, 1913, writes: "It breeds normally in mesquit and probably some other desert trees. I used to breed it from mesquit cord wood, along with a larger species, *A. fortis*, and have received it from the more desert parts of Los Angeles County and Imperial County and so forth. It ranges, I think, throughout the desert southwest, running well into Mexico. *A. fortis* extends farther south into South America and even into the Galapagos Islands. I do not know of either species attacking living trees, though can believe that they would if the trees were diseased or dying, or if they had dead limbs still attached in which they could get a start."

Distribution.

The distribution of this beetle is apparently quite wide. It was first reported from Los Angeles County, October 4, 1891, by D. W. Coquillett.[2] Specimens were received from the same place in September, 1913, from Mr. B. R. Jones. Mr. Geo. P. Weldon has reported the work of this beetle at Dyerville, Humboldt County, and Stockton, San Joaquin County. Prof. H. C. Fall[3] gives the following localities: Riverside, Riverside County; Redlands, San Bernardino County; Pomona and Long Beach, Los Angeles County. Dr. Edwin C. Van Dyke reports it as occuring in the Southwest, especially mentioning Los Angeles and Imperial counties.

Food Plants.

Dead or dying wood seems to be the preferred food of this insect and allied species. Dr. Van Dyke gives the mesquit or algaroba [*Prosopis juliflora* (Schwartz) DC.] a desert plant common in the southwestern part of the United States as the normal food plant. Mr. Weldon reports pear as a host. Coquillett bred adults from dead branches of a fig tree and from the dry canes of a grapevine. The apricot is also a host, having been sent in by Mr. Jones of Los Angeles. Mr. Leroy Childs reports this insect working very extensively in dry orange wood at Redlands, Cal.

Control.

With the present fund of knowledge, the only control measures to suggest are:

1. Destroy breeding places if possible.
2. If present in an orchard, eliminate unhealthy or dead trees.
3. Keep trees in good growing vigor. They are less liable to become infested.
4. Prune out and burn all dead wood.

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[2]Insect Life, IV, p. 261, 1892.

[3]Coleoptera of Southern California, Cal. Acad. Sciences, VIII, p. 134, 1901.

AN IMPROVEMENT IN THE SETTING OF WAYSIDE TREES.

By A. L. BANCROFT, Oakland, Cal.

Because trees have been set in stiff, exact rows along the waysides for ages, the possibility of there being any different and better way is apparently never even thought of.

Consider nature's way of grouping her trees and plants: there are no straight lines and no uniform and exact spaces between growing things of her setting, and she attains far better and more artistic results in her work than the man with the straight-edge and measuring line, and there is no end to her ever-changing combinations and artistic effects. The "English garden," with its stiff straight lines, is an abomination. The best to be secured is to follow along nature's lines, but adopting them to the varying conditions of the waysides.

In place of rows set the trees in clumps, as a rule of but a single variety in a clump. Let the clumps vary in size and natural groupings to fit the place, from three to thirty in a bunch; the distance apart of the trees and the number in a clump to depend upon the size and growth, habit of the tree and the distance between the clumps to depend upon the lay of the land, the soil, moisture, exposure, and other conditions.

The grouping of the trees should be the work of landscape artists, the best available. Their work would add much to the beauties of the landscape that took in such roads. Some clumps might extend two or three trees deep into the roadway, and, with the consent and cooperation of the landowner, some might also project back into the fields. Others, like the tall straight lombardy poplar and *Eucalyptus globulous*, would be effective in straight strings of about five in a line. The setting of the stakes for the clumps and for each tree in the clump should be the result of intelligent, artistic consideration given to each particular group. The spaces between clumps should be, probably, from fifty to two hundred feet. By this way of treating the waysides much better results can be obtained. The view of the road from a distance would be vastly more attractive, and the view from the roads would be much more enjoyable than to have it alternate every second or two by trees cutting off the view.

The roads would have more sun to dry up the summer as well as the winter rains, which would be an economic feature of importance enough to be taken into account and there would be numerous shady places under which to alight and enjoy the vistas.

Much more might be said upon this subject, but this is enough to show that this way would be a great improvement.

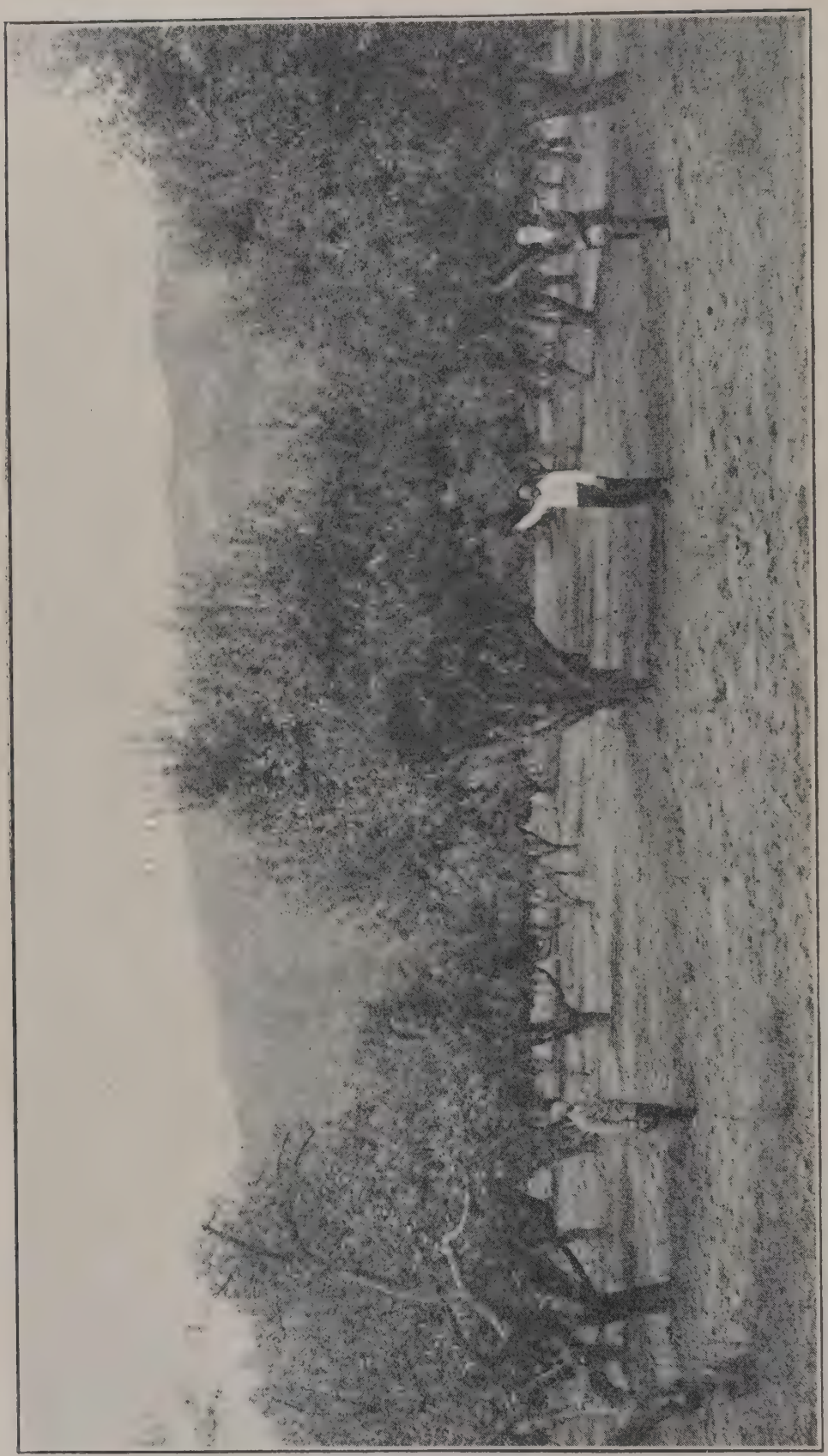

FIG. 374.—Madera County apple orchard in mountains near Nipinnawasee, said to be 50 years old. Note the almost perfect stand of trees. (Original.)

HORTICULTURAL NOTES FROM MADERA COUNTY.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

In company with Mr. Geo. Marchbank, County Horticultural Commissioner of Madera County, several days were spent investigating the horticultural interests of the mountainous section adjacent to the towns of Raymond, Oakhurst, Coarse Gold, Nipinnawasee and Miami.

While orcharding is not generally followed as a profession throughout this locality, the writer was impressed with the great possibilities for future development. At present, transportation facilities are such as to discourage anyone from going in extensively for growing fruit. The building of a railroad into this section would undoubtedly add a tremendous impetus to the industry; until such a road is built there is no way for the fruit to reach the market, except that it is hauled by team or auto truck a distance of 30 miles or more. The auto truck has already made its way into many not easily accessible parts of the mountains and may eventually solve the transportation problem to a large extent.

Apple Growing in Madera County.

The apple is the principal fruit grown in the mountains. A considerable acreage has been planted to this fruit in the past. At present many orchards are receiving very little attention because of the distance from market and the competition that must be met, with the growers who have the advantage of a railroad. Even with very little or no care in the way of cultivation, pruning, spraying, etc., a great many of the trees look well and are loaded down with clean, well-sized apples. Fig. 374 is from a picture taken of an apple orchard which is said to be 50 years old. The stock has been allowed to run in this orchard, and of late years it has received little attention; nevertheless, there is still almost a perfect stand which attests to the suitability of the soil and climate for growing trees.

Varieties.

The following varieties were found to be doing well in one or more of the orchards visited: Yellow Newtown Pippin, Yellow Bellflower, White Winter Pearmain, Delicious, Winesap, Staymen Winesap, Ortley, Rhode Island Greening, Arkansas Black, Mammoth Black Twig, Nero. Spitzenberg, Black Ben Davis, Ben Davis, Maiden Blush, as well as many others of lesser importance.

Particular mention should be made of the Delicious variety, some excellent specimens of which were seen in Mr. Frank Femmons' orchard. Fig. 375 is a picture of one of these trees. Mr. Femmons, the pioneer apple man of the section, who has always had faith in the future of the fruit industry, and who possesses a thorough knowledge of the apple, is standing in the foreground. The tree is about 18 years old and is loaded down with fine fruit, as are all the rest of the trees of this variety in the orchard.

The Staymen Winesap is also doing remarkably well and a number of trees of the Nero variety are loaded to the ground

FIG. 375.—Well loaded Delicious apple tree in orchard set out by Mr. Frank Femmons, near Sugar Pine. (Original.)

FIG. 376.—White Winter Pearmain apple tree growing at an altitude of approximately 5,000 feet, near Sugar Pine. (Original.)

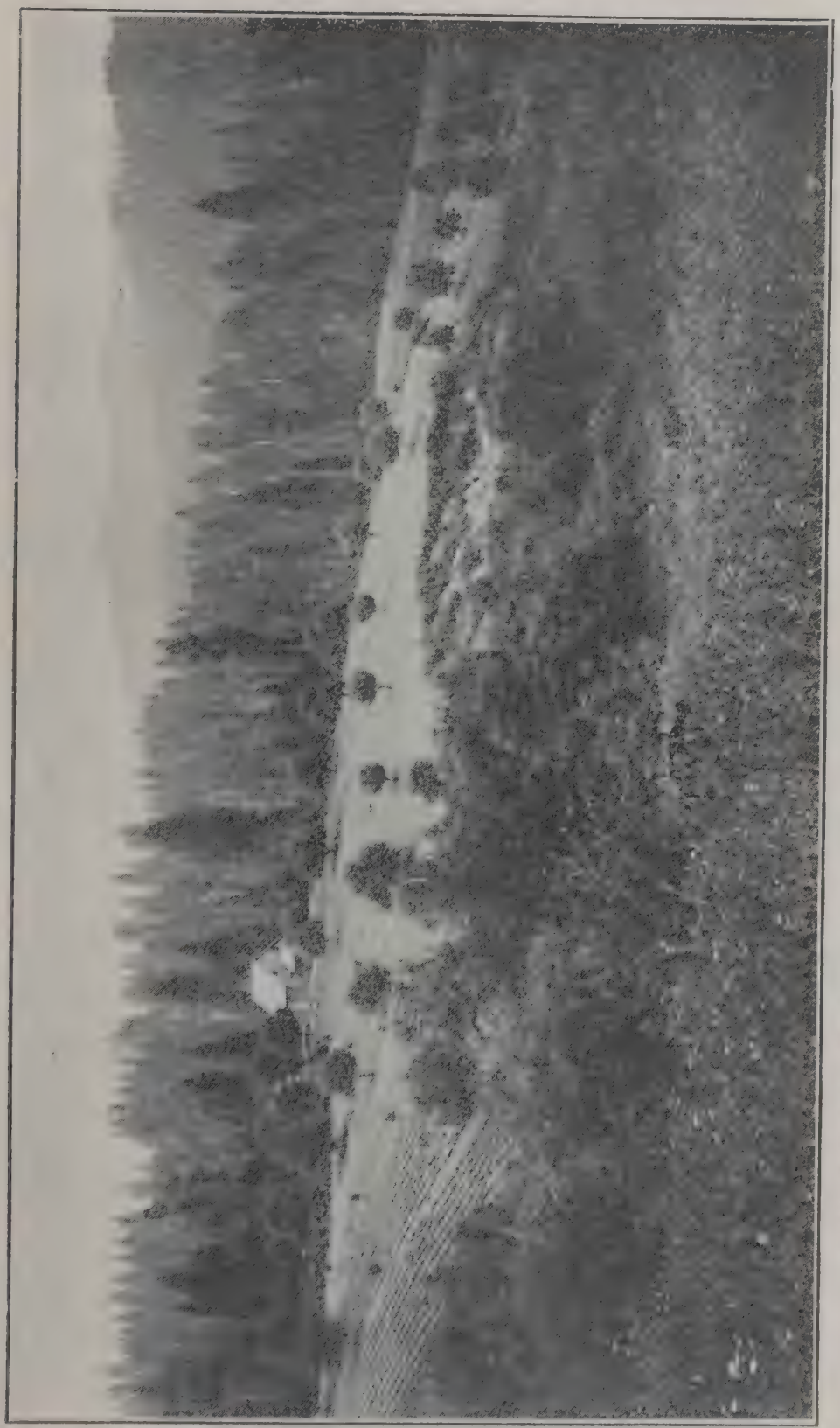

FIG. 377.—Orchard of Major Darnold near Sugar Pine at an altitude of about 5,000 feet. (Original.)

The White Winter Pearmain seems to have been quite a general favorite for planting in this locality. It pleased me to see this variety doing so well, as it certainly possesses much merit, and but for its color, would be one of our greatest sellers. A tree of this variety is shown in Fig. 376, growing at an altitude of between 4,000 and 5,000 feet. It has on it a good crop of fruit this season; this is also true of other trees of the same variety in the orchard. Fig. 377 gives a good idea of the character of the country where the orchard is growing.

Small Acreage Best.

At present it would probably not be policy to plant apples extensively in the mountains of Madera County (and what is said of Madera will apply to some of the other mountainous counties as well), but the fact that the soil and climate are well adapted to the growing of this, one of the finest of all fruits, indicates that there are great possibilities for success with small tracts at least, of good varieties, well cared for. Some have planted too extensively and have failed, partly because of poor varieties, but principally because of distance from market. At the present time there should be no trouble about picking out suitable varieties, provided the prospective planter will take the pains to investigate and find out which have done the best. It is doubtful, however, that a large acreage of the best varieties could be made to pay at the present time. On the other hand, a small tract, not to exceed 5 acres, would not necessitate a heavy expense in caring for it, and should be made to pay good interest on the investment, even though the distance from a railroad point is great.

Only Good Fruit Pays.

The growing of the very best quality and grade of any variety should be the ambition of one starting in the business. To accomplish this end the orchard should be properly pruned, tilled, fertilized, sprayed, etc. Fig. 378 is a good illustration of the extreme neglect of some of the orchards seen. The tall tree was estimated to be 35 feet high. The tree alongside is about the desirable height. Careful annual pruning would overcome this fault, and the fruit, instead of being small, would be of good size; the tree instead of breaking down under a load, if properly pruned, would hold it up well. Not only is pruning neglected in these orchards, but also cultivation, fertilization, and spraying. No orchard will care for itself, and unless these different phases of management are properly conducted, there can be little chance for good fruit, which, after all, is the only kind that it pays to raise.

FIG. 378.—Apple trees showing extreme neglect of pruning. (Original.)

GENERAL NOTES.

THE SEBASTOPOL GRAVENSTEIN APPLE SHOW.

As chairman of the awarding committee at the Sebastopol Exposition, acting with Messrs. Henry C. Peckham of Watsonville, J. A. Evereth, San Francisco, and George P. Weldon, Chief Deputy State Horticultural Commissioner, I am pleased to report a wondrous display of Gravenstein apples. The Alexanders were also very fine. There was a substantial improvement over the exhibit of last year, good and creditable as that was.

In judging, forty demerits were given for each wormy fruit; eight for any show of scab, one for absence of stem, and one for any show of dry rot. Other demerits were given for lack of color, inferiority of size, lack of uniformity, etc. Last year the demerits generally reached nine hundred, more or less in a single collection, and nearly always reached to the hundreds. This year two exhibits, both by ladies, received a perfect score. Few had off counts reaching three figures, while most ran less than thirty. In large exhibits, every apple in three boxes, taken at random, were carefully inspected; in those of less magnitude, two boxes were thus examined, while one box was inspected in each exhibit. The perfection of this fruit was certainly phenomenal. Mr. Peckham, who has had long experience in growing, exhibiting and judging fruit, said he had never seen a finer collection of apples at any exhibition. He doubted if it could ever be surpassed.

The evident progress in developing excellence of fruit in grading and packing are proof positive that such exhibitions are richly worth all that they cost in time, labor and expense.

The feature exhibits were also remarkable for the ingenuity displayed in their conception, and also for their attractiveness. No wonder that the attendance was surprisingly large. While such fruit shows are commendable for their pleasure giving, they are at the same time very educatory. They will surely lead to a perfect pack, and will aid much to foster standardization.

In autoing through Sonoma County, we observed everywhere excellent cultivation of the orchard. The great reputation that this section has gained for its superior fruit, is, we believe, to a large extent indebted to these annual apple exhibits. The matter of thinning and spraying must certainly receive close attention, else the fruit exhibited at this apple show would never present such remarkable perfection.—A. J. Cook.

EFFECTS OF HOT WEATHER ON LEMON TREES SPRAYED WITH LIME-SULPHUR.

An interesting development was noticed in the fact that lemon trees sprayed with both Rex and Ortho lime-sulphur solutions for a period of ten days before the excessive heat, were very seriously burned. Quite a percentage of the fruit on the southwest corner of the trees was completely ruined. I have never seen the effects of spray injury followed by heat extend back over so long a period.—R. S. Vaile.

TENTATIVE PROGRAM OF THE FORTY-THIRD CALIFORNIA STATE FRUIT GROWERS' CONVENTION.

San Jose, Cal., Dec. 2, 3, 4, 1913.

1. Soils—3 lectures; Dr. C. B. Lipman, University of California, Berkeley, California.
2. General Comments on the Citrus Industry—Dr. H. J. Webber, Citrus Experiment Station, Riverside, California.
3. Should Growers Breed the Crops they Grow—Dr. H. J. Webber.
4. The Peach and its Culture—C. C. Collins, Dinuba, California.
5. State and Federal Quarantine—Frederick Maskew, Chief Deputy Quarantine Officer, San Francisco.
6. Unfermented Fruit Juices—Karl J. Stackland, Cave, Oregon.
7. Notes and Records of County Horticultural Commissioner, R. S. Vaile, County Horticultural Commissioner, Ventura County, Santa Paula, California.
8. Thinning Deciduous Fruits—Geo. P. Weldon, Chief Deputy Commissioner of Horticulture, Sacramento, California.
9. Standardization of Fruits—F. B. McKevitt, Sacramento, California.
10. Frost Protection—C. C. Teague, Manager Limoneira Ranch, Santa Paula, California.
11. Irrigation—Willis Jones, Claremont, Cal.
12. Alfalfa—A. J. Cook, State Commissioner of Horticulture, Sacramento, California.
13. Importance of Red Spider Control—H. P. Stabler, County Horticultural Commissioner, Yuba City, Sutter County, California.
14. Fungi—H. S. Fawcett, Assistant Professor of Pathology, Citrus Experiment Station, Whittier, California.
15. My Almond Orchard—Miss Carrie A. Whelan, Oakland, California.
16. Walnut Culture—Dr. W. W. Fitzgerald, Stockton, California.

A NEW APPOINTMENT.

On September 22d, Mr. Leroy Childs of Redlands, California, was appointed assistant secretary of the State Commission of Horticulture. Mr. Childs graduated from Stanford University in May, 1913, and has since then been field assistant of the Bureau of Plant Industry, United States Department of Agriculture, under Dr. E. P. Meinecke, Forest Pathologist for the Pacific coast. At the time of his appointment, he was considering a position which had been offered him by Dr. E. L. Van Dine of the Porto Rico Board of Agriculture, and only the more favorable work in this state induced him to remain in California, to become a member of the commission, in a most needy place. Both Dr. Kellogg and Prof. Doane of Stanford University recommend him most highly. He is certainly amply qualified for the position he now holds and is a most valuable addition to the horticultural work of the State.—E. O. Essig.

JAPANESE LAW RELATING TO INSPECTION OF EXPORTED ORNAMENTAL AND NURSERY STOCK

For years the officers of the Department of Agriculture and Commerce of the Japanese Government have been looking seriously to the passing of a bill to prohibit the exportation of ornamental and nursery stock which was infested with injurious insect pests and plant diseases. It was only recently that such a law has been passed and put into execution in Japan, and inspectors are now busy inspecting and fumigating all ornamental and nursery stock at the main ports where they are shipped to foreign countries.

The history of the California State Quarantine Division at San Francisco has disclosed many facts relative to the importation of horticultural products from Japan, and no doubt the new Japanese law will be warmly welcomed, not only by this division, but by the entire State. The Japanese, on the other hand, have appreciated the efforts of the quarantine officials of California and the great work that has been done in connection with the Oriental staff of quarantine inspectors with a view of protecting not only California, but the entire United States.

The rapid growth of horticulture in Japan at the present day has also made it urgent to establish and maintain a quarantine inspection at the ports of entry, to prevent the importation of nursery stock infested with injurious insect pests and fungous diseases. The Japanese entomologists have prepared a bill providing for this protection, but it has not yet been brought before the Congress at Tokio. In Korea, however, such a law has already been passed and the horticultural quarantine inspectors are already at work at the six largest ports of entry, under the direction of Mr. Kisaka, entomologist of the Korean Agricultural Experiment Station. The passage of such a law in Japan will do much to protect her growing horticultural industries and will aid other countries to a large extent also.—S. Nakayama, Stanford University.

QUARANTINE REGULATION NO. 4.

Peach Yellows and Peach Rosette.

To whom it may concern:

In an endeavor to bring about a safe and sane application of each provision of the State Quarantine Law, the State Commissioner of Horticulture of the State of California has caused diligent inquiry (covering a period of two years) to be made at all sources of information, both official and otherwise, concerning the distribution of "peach yellows" and "contagious peach rosette" in and throughout the United States.

Based upon the findings submitted to the State Commissioner of Horticulture of California by the Missouri State Board of Horticulture as the result of an official orchard survey of that state ordered by the legislature, and which was made and continued over a period of two years, and during all of which period no evidence of "peach yellows" or "peach rosette" was found to exist in the orchards of the State of Missouri;

It is, until further ordered, hereby declared that the provisions of Section 6 of the State Quarantine Law of the State of California do not apply to any district within the boundaries of the State of Missouri.

(Signed.) A. J. Cook,
State Commissioner of Horticulture.

CALENDAR OF INSECT PESTS AND PLANT DISEASES.

By E. J. Vosler, Assistant Superintendent of the State Insectary.

[Under the above heading the author aims to give brief, popular descriptions and methods of controlling insect pests and plants as near as possible just prior to or at the time when the suggestions given should be carried into effect by the growers.]

DECIDUOUS AND CITRUS FRUIT INSECTS.

The Fall Cankerworm.

The eggs of the fall cankerworm, a pest of apple, prune, cherry and apricot, are attached to the bark of the fruit trees in masses of from 60 to 200, placed side by side in exposed situations, by the wingless females which emerge from the middle of October to the middle of December. Mr. E. O. Essig[1] recommends the use of bands around the tree trunk, placed in September and October, to be renewed occasionally because of the heavy winter rain, to trap the females as they ascend the trunks to deposit their eggs.

Spraying for the Black Scale on Olive.

The use of distillate emulsion, according to the forumla given below, as soon as the olives are picked, is recommended in the "Injurious and Beneficial Insects of California", by E. O. Essig:

Distillate Emulsion.

Distillate (28 degrees Baumé)	20 gallons
Whale-oil soap	30 pounds
Water to mix	12 gallons

Dissolve the whale-oil soap in the water, heating it to the boiling point; add the distillate and agitate thoroughly while the solution is hot. For use, add 20 gallons of water to each gallon of the above mixture.

The crude oil emulsion is also recommended as given under the next topic "Spraying for the Brown Apricot Scale."

Spraying for the Brown Apricot Scale.

The time is approaching for remedial measures against the well known brown apricot scale, enemy of various deciduous trees, particularly the prune. E. O. Essig recommends spraying with caustic soda distillate water, a chemical mixture, or distillate emulsion and crude oil emulsion, when the trees are dormant. In many cases it is advisable to spray before all the leaves fall. The formula for the distillate emulsion is the same as for the black scale, and the following is the formula for the caustic soda mixture.

Water	200 gallons
Caustic soda (95%)	7 pounds
Distillate (28 degrees Baumé)	10 gallons

Fill spray tank with the required amount of water; add the caustic soda which has been dissolved in a small amount of water, and then the distillate. Keep agitator going rapidly while applying the spray.

[1]Injurious and Beneficial Insects of California, by E. O. Essig, page 187.

Crude Oil Emulsion.

Water	175 gallons
Liquid soap	3 gallons
Crude oil (direct from wells)	25 gallons

Fill the spray tank with 175 gallons of water; add the liquid soap; agitate thoroughly for one minute, after which add the crude oil, continuing the agitation while the spray is being applied.

Fumigation.

The time is right for the fumigation of black scale in most localities between August 15th and January 1st, though this period may vary in some localities with the hatch of the scale. It is desirable to fumigate as soon after all, or as many as possible, of the young scale are hatched. The three fourths or even the half of the regular schedule No. 1 may be used, the latter especially where the hatch is even and the scale young.

In Tulare County, September seems to be an excellent month for the treatment of the longulus scale. Experiments conducted by Commissioner Schulz indicate the efficiency of a two thirds dosage of Schedule No. 1, which seems to do fully as well as the full dosage.

CEREAL AND FORAGE CROP INSECTS.

The Clover Seed Chalcid.

(*Bruchophagus funebris* How.)

A reduction in the alfalfa seed crop after thrashing, when before there was much promise of a large crop, has often puzzled many of our alfalfa seed growers.

A little insect of the hymenopterous family, Eurytomidæ, very often brings on the foregoing result. The seriousness of this pest may be

FIG. 379.—The clover seed chalcid, *Bruchophagus funebris* How. Adult female, greatly enlarged. (After Webster.)

seen from the statement of one of the experts of the United States Bureau of Entomology working on this pest that fully 50 per cent of the seed crop in certain portions of Arizona, was destroyed by this chalcid.

The adults are black with brown eyes and light brown feet. The eggs are deposited in the seeds, which, at the time of egg laying, are in a semi-fluid condition. The larvæ, on emerging from the egg, feed

on the substance of the seed and often totally destroy the contents. Infested seeds are light weight and of a grayish color. The winter is spent as a larva in the seeds, which often drop to the ground. The adults from these over-wintering larvæ do not emerge until the following spring, or in the early summer. There are several generations.

The clover seed chalcid, as it is commonly called, will infest the seed of red and crimson clover besides alfalfa, a favorite host.

Remedies for this pest are so far in an experimental stage. Mr. T. D. Urbahns, an expert of the Bureau of Entomology, United States Department of Agriculture, is now working upon the insect in California and possibly will have suggestions to offer on the control of this pest in the near future. Professor F. M. Webster[1] suggests, as preventative measures, the destruction of all outstanding alfalfa plants in the fall and the chaff and stems burned up after threshing. This will go a long way to reduce the numbers of the pest the following years. Delaying the seed crop by early pasturing or clipping of the first growth in the spring until the seed chalcid has done most of its destructive work, holds a promise in the future for control measures.

Another Locust Poison.

Prof. F. M. Webster, in charge of cereal and forage insect investigations, United States Bureau of Entomology, writes that the government of Cape Colony, South Africa, has been using the following mixture for the destruction of locusts, or grasshoppers, as they are commonly called, with apparently excellent success:

> "The mixture consists of one gallon of a treacle, which may be made of a low grade molasses or glucose, or even with dissolved sugar, mixed with a one half gallon water solution of arsenite of soda (69 per cent white arsenic). This mixture is diluted for newly hatched locusts to one part to 66 of water; when used against locusts a couple of weeks old, it is diluted one part to 50 of water. Where the application is made in fields not accessible to domestic animals, farmers have used it as strong as one to 30 or 40."

This mixture appears to be well worth trying under California conditions.

Since the egg pods of grasshoppers are deposited in the hard, uncultivated lands during the late summer and early fall, plowing, harrowing and disking such waste lands to the depth of several inches in the late fall will do much to lessen future attacks.

The Alfalfa Caterpillar.

No doubt many of our alfalfa growers have noticed large green worms with a white stripe on each side of the body, feeding on the leaves of the alfalfa plants. The adults of this worm are the common yellow butterflies, which are numerous in the fields. At this time of the year, the damage done by this insect is much lessened, as many are going into hibernation, besides the destruction of a large number by the wilt disease. Horticultural Commissioner Carl J. Ley, of Glenn County, reported in September that a large percentage of the larvæ

[1]Circular No. 69, p. 9, Bureau of Entomology, U. S. Department of Agriculture

of the alfalfa caterpillar were found dead hanging to the alfalfa stalks, as the result of this disease.

Renovating alfalfa fields during the winter months will not only be of material benefit to the alfalfa itself, but will destroy large numbers of the hibernating pupæ. Pasturing the alfalfa fields will also aid in the destruction of the resting stage of this insect.

TRUCK CROP INSECTS.

Fall Plowing as a Cutworm Remedy.

An excellent example of fall plowing, as a method for control of cutworms on sugar beets, was observed near a small town in Salt Lake County, Utah, by the writer, in the spring of 1912. Several acres of sugar beets were planted that year, part of which were on soil plowed the previous fall and the remainder on land plowed several weeks before planting. Practically 75 per cent of the sugar beets on the spring plowed land were killed by the cutworms, while a good stand was secured in the fall plowed portion of the field. The question arises, did fall plowing pay?

The Tomato Worm.

Various reports of the damage to tomatoes by the corn ear worm, *Heliothis obsoleta,* have been received by the State Insectary force, particularly from the field agents of the Libby, McNeil and Libby canning plant at Sacramento. The worms eat large holes in the fruit, bringing on decay. From the present equipment for washing tomatoes in the canning factories, it is not advisable to spray the tomato vines with any form of arsenic in the hope of killing the worms as they endeavor to enter the tomatoes.

The use of an early trap crop, as well as early maturing varieties, the hand-picking of infested tomatoes to prevent the worms spreading, fall plowing of infested ground, and the proper disposal of unsalable, infected tomatoes, will go a long way to protect the next year's crop.

FUNGOUS DISEASES OF PLANTS.

Spraying for Peach Blight.

As a remedy for the peach blight fungus, the California Experiment Station in Bulletin No. 191, recommends spraying, between October 25th and November 25th, with Bordeaux mixture, using 30 pounds bluestone, 35 pounds lime, to 200 gallons of water. This fungus begins its work in the fall and the peach trees must be sprayed at that time. The disease causes dead spots to appear on the young shoots during the winter months, particularly at the buds. The buds are killed, together with much of the young growth.[1]

In February, the use of lime-sulphur solution of Bordeaux mixture, 20-20-200, will control the peach-leaf curl fungus. This fungus curls the leaves, which afterwards fall, together with some of the fruit.

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[1]Bulletin No. 218, California Exp. Sta., p. 1149.

One Cause of the Failure of Tomatoes to Set Fruit.

The attention of the State Commission has been called by various truck gardeners in and around Sacramento to the failure of tomato vines to set fruit after a large number of blossoms had formed. The vines were thrifty and blossomed well. The flowers would hang on the vines for a certain period of time, then fall off, leaving part of the peduncle attached to the stem.

Specimens were sent to Mr. H. S. Fawcett, then plant pathologist of the State Commission, who determined the fungus as a species of *Macrosporium*, possibly that species known to cause the late blight of potatoes and the fruit spot of tomatoes. The writer placed several stems and blossoms of an infested tomato plant in a moist chamber for several weeks, and on examination, thousands of spores of this fungus were obtained.

A grower used 10 pounds of precipitated sulphur to 100 gallons of water on his tomato vines which had hitherto failed to set fruit, and was rewarded by a fair crop of tomatoes. Mr. H. S. Fawcett advised the use of Bordeaux mixture in an experimental way.

MONTHLY CROP REPORT—SEPTEMBER.

Inasmuch as practically all of the deciduous crops have been harvested it was thought best to make this last report in the form of a summary of general conditions. To obtain the necessary data the following information was requested of the county horticultural commissioners:

1. General conditions of crops for the year, whether good, poor or normal.
2. Returns for crops compared with other years.
3. General conditions of crops not yet harvested.

The following responses of the horticultural commissioners have been published in full:

El Dorado County:

Crop conditions in this county have been a fair average with the exception of grapes, while prices have been better than last year.—J. E. HASSLER.

Fresno County:

Alfalfa—normal crop; condition good; returns 100 per cent. *Apricots*—50 per cent crop; condition poor; returns 50 per cent. *Figs* (*California black*)—120 per cent crop; condition good; returns 125 per cent. *Grapes* (*raisin*)—60 per cent crop; condition poor; returns 50 per cent. *Grapes* (*table*)—60 per cent crop; condition poor; returns 60 per cent. *Grapes* (*wine*)—80 per cent crop; condition normal; returns 120 per cent. *Lemons*—75 per cent crop; condition good. *Olives*—150 per cent crop; condition good. *Oranges*—normal crop; condition good. *Peaches* (*canning*)—70 per cent crop; condition normal; returns 100 per cent. *Peaches* (*drying*)—70 per cent crop; condition normal; returns 100 per cent. *Plums* (*canning*)—100 per cent crop; condition normal; returns 100 per cent.—F. C. SCHELL.

Kings County:

Alfalfa—normal crop; condition normal; returns $9 to $12.50 per ton. *Apricots*—37½ per cent crop; condition affected by frosts; returns 33 per cent higher than 1912. *Grapes* (*raisin*)—60 per cent crop; condition affected by frosts and drought but fruit firm; returns raisin exchange prices. *Grapes* (*wine*)—60 per cent crop; condition affected by frosts and drought but fruit firm; returns $10 to $12 per ton. *Peaches* (*canning*)—80 per cent crop; condition affected by frosts and drought; returns 35 per cent above 1912. *Peaches* (*shipping*)—80 per cent crop; condition affected by frosts and drought; returns 35 per cent above 1912. *Peaches* (*drying*)—80 per cent crop; condition affected by frosts and drought; returns 40 per cent higher than 1912. *Prunes*—50 per cent crop; heat caused dropping; returns 50 per cent above 1912.—B. V. SHARP.

Lake County:

The fruit crop of Lake County this year has been of good quality. The *grain* and *hay* crop has also been of good quality. *Hops* have been up to the average in quality. *Wine grapes* have done well. *Apples, almonds* and *prunes* are a short crop. *Bartlett pears* are 75 per cent of last year's crop. The amount of *grain* and *hay* in quantity will compare favorably with former years. Although the fruit crop is short the cash returns will be up to the average on account of high prices. *Wine grapes* will make better returns than usual.—GEO. A. LYON.

Madera County:

Alfalfa—general condition good; returns above normal. *Almonds*—general condition fair; returns normal. *Apples*—general condition good; not harvested yet. *Apricots*—general condition poor; returns poor; below normal. *Figs*—general condition fair; returns normal. *Grapes* (*raisin*)—quantity 55 per cent; quality poor; returns equal 1912. *Grapes* (*Thompson's seedless*)—price will be about double of last year. *Grapes* (*wine*)—looks like 65 per cent; price better than last year; returns equal to last year. *Hay*—general condition good; returns about like last year. *Olives*—general condition good; returns better than last year. *Peaches*—general condition fair; *Peaches* (*drying*)—old orchards 35 per cent to 40 per cent short; young orchards bring it up to 80 per cent of normal; returns less than normal. *Peaches*—(*shipping*)—general condition good (dried). *Pears*—general condition good; dried and sold locally; returns normal. *Prunes*—general condition fair; returns better than normal.—GEO. MARCHBANK.

Nevada County:

Alfalfa—crop 110 per cent, due to rains that extended through June. *Almonds*—*IXL*, crop 20 per cent; *Ne Plus Ultra*, crop 20 per cent, due to frost. *Apples*—*Bellflower*, crop 60 per cent; *Gravenstein*, crop 60 per cent; *Newtown Pippin*, crop 60 per cent; other varieties, crop 60 per cent, due to rain during blossoming time, preventing proper pollination. *Apricots*—*Blenheim*, crop 30 per cent; *Moorpark*, crop 20 per cent; *Royal*, crop 30 per cent, due to cold rains and freezing at time young fruit was setting. *Berries*—*Blackberries*, crop 100 per cent; *Loganberries*, crop 100 per cent; *Raspberries*, crop 100 per cent; *Strawberries*, crop 100 per cent; other kinds, 100 per cent. *Cherries*—*Black Tartarian*, crop 75 per cent; *Lambert*, crop 75 per cent; *Royal Anne*—crop 75 per cent; other varieties, crop 75 per cent, due to frost. *Figs*—*California Black*, crop 90 per cent; *Smyrna* types, crop 90 per cent; *White Adriatic*, crop 90 per cent; first crop slightly hurt by frost. *Grapes* (*raisin*)—*Muscat*, crop 80 per cent; *Sultana*, crop 100 per cent; *Thompson's Seedless*, crop 100 per cent; other varieties, crop 100 per cent. Short *Muscat* crop due to sun scald. *Grapes* (*table*)—*Malaga* crop 100 per cent; *Tokay* crop 90 per cent; other varieties crop 100 per cent.

Short *Tokay* crop due to sun scald. *Grapes (wine)—Zinfandel* crop 100 per cent; other varieties crop 100 per cent. *Hay*—crop 120 per cent, due to late rains. *Olive (Mission*—crop 100 per cent. *Peaches (canning)—Levy,* crop 50 per cent; *Phillips' Cling,* crop 50 per cent; *Tuskena* crop 505 per cent, due to frost. *Peaches (drying)—Crawford,* crop 50 per cent; *Muir* crop 80 per cent; *Lovell* crop 30 per cent, due to frost. *Peaches (shipping)—Elberta* crop 80 per cent; other varieties crop 50 per cent, due to frost. *Pears—Bartlett,* crop 70 per cent; other summer varieties, crop 75 per cent; winter varieties, crop 75 per cent. Continuous rains at time of blossoming prevented pollination. *Plums (canning)—Green Gage,* crop 80 per cent; *Yellow Egg,* crop 80 per cent; *Hungarian,* crop 80 per cent; due to frost. *Plums (shipping)—Tragedy,* crop 70 per cent; other varieties, crop 80 per cent, due to frost. *Potatoes*—crop 125 per cent, due to late rains. *Prunes—French,* crop 90 per cent, due to frost. *Walnuts—Softshells,* crop 90 per cent; *Budded,* crop 90 per cent; *Franquette,* crop 90 per cent; other varieties, crop 90 per cent, due to frost.

Agricultural conditions good. *Hay* and *grain* 10 per cent above average; *potatoes* 25 per cent above average; crop not all harvested. Other agricultural products fully up to average; good market and better prices than last year; conditions of crops not harvested, good. Horticultural: Crop 60 per cent of normal; better prices prevailed than in former years; our *Bartletts* selling from $2.85 to $3.50 per box. *Apples* and *winter pears* not harvested; crop 60 per cent of normal; in good condition.—D. F. NORTON.

Merced County:

Alfalfa—large crop. *Almonds*—crop 10 per cent. *Apples*—crop 90 per cent. *Apricots*—crop 10 per cent; *Beans (black eyed)* full crop. *Berries—Blackberries,* crop 100 per cent; *Loganberries,* crop 100 per cent; *Strawberries,* crop 100 per cent. *Figs—California Black,* crop 100 per cent; *Smyrna* types, 100 per cent; *White Adriatic,* 100 per cent. *Grapes (raisin)—Thompson's seedless* crop 60 per cent; *Grapes (table)—Malaga*—crop 75 per cent; Tokay crop 50 per cent; *Grapes (wine)* crop 75 per cent; *Zinfandel* crop 75 per cent. *Hay*—crop 30 per cent; *Lemons*—crop 30 per cent; *Olives—Manzanillo,* crop 100 per cent; *Mission,* crop 100 per cent; other varieties, crop 100 per cent. *Oranges (Navel)*— crop, 50 per cent; *Peaches (drying)*—crop, 40 per cent; *Crawford,* crop, 40 per cent; *Muir,* crop, 60 per cent; *Lovell,* crop, 40 per cent. *Peaches (shipping)—Elberta,* crop, 60 per cent. *Pears (Bartlett)* crop, 50 per cent; winter varieties, crop 90 per cent. *Plums (shipping)* crop, 40 per cent. *Potatoes (sweet),* crop very large. *Walnuts,* crop 100 per cent.—N. H. WILSON.

Modoc County:

The general condition of our crops for this year was splendid. The returns, as compared with other years, have been better. The condition of crops not yet harvested, is good.—O. C. MCMANUS.

Monterey County:

Almonds—crop, 125 per cent. *Apples*—crop, 15 per cent. The last injury was by the hot spell, September 15th to 18th. *Apricots*—crop, 150 per cent. *Cherries*—crop, 75 per cent; *Grapes (wine)*—crop 60 per cent; *Grapes (table)*—crop, 50 per cent. *Olives*—crop 50 per cent. *Peaches*—crop, 80 per cent. *Pears*—crop 75 per cent. *Plums (shipping)*—crop, 75 per cent. *Prunes*—crop, 70 per cent.—J. B. HICKMAN.

Placer County:

The deciduous fruit season is about ended. The general condition of crops this season has been good and we have harvested between 65 per cent and 70 per cent, it is estimated. The returns have been better than usual, so that growers will be as well off, financially, as in other years. Crops yet to be harvested, viz., *olives* and *oranges,* are showing up well and we will have an average crop.—H. H. BOWMAN.

Riverside County:

Almonds, apricots, peaches, have all produced full crops of first class fruit, and prices received for same have been very satisfactory. Production of above varieties will run 25 per cent to 30 per cent above last year. *Cherries* also produced above a normal crop, with good prices for most of the output. *Grapes,* both wine and table, have suffered some from sunburn, but the yield will be up to that of last year. Prices for table varieties have been satisfactory. Our wine grape acreage is nearly all in the hands of large concerns, who have their own facilities for manufacturing wine, hence am unable to give very accurate information as to prices being paid for grapes to outside parties. *Lemons* in the Riverside district will yield a light crop this season. The Corona section is shipping almost its usual quantity of this fruit and very satisfactory returns are the rule. The citrus, including all varieties will, we estimate, run about 65 per cent of normal throughout the county, Corona district leading in quantity per acre. *Pears* and *prunes* are grown commercially in limited quantities in our county. Crops of above varieties have been good, and good prices have prevailed for same. *Walnuts* now being harvested will run 80 per cent to 85 per cent normal crop, with prices good. *Olives* promise a good crop of fine fruit with satisfactory offerings for the output, both oil and pickling varieties. Our citrus groves in sections that were severely injured by last season's cold, are recovering in splendid shape, and barring any further calamity of similar nature, should practically reach their normal production during the 1914 crop. This, I think, will be especially true of oranges; lemons will probably not reach normal production before 1915 crop.—R. P. CUNDIFF.

Sacramento County:

Deciduous—in quantity, below average; quality, good; prices, good. *Citrus*—in quantity, about an average crop. *Hay*—nearly an average crop; quality good; prices good. *Grain*—not quite an average crop; quality, good; prices, good. *Vegetables*—nearly an average crop; quality good; prices good. As a whole, crops below normal,

with prices above normal. Returns are better than average year. Wherever irrigation is being resorted to, crops are doing fine, and look as well as in the ordinary year—F. R. M. BLOOMER.

San Bernardino County:

The returns for crops as compared with last year or other years is difficult to ascertain, as there are numbers of packing houses with no one near from whom to get reports. The railroads can give us shipments, but not returns. However, the report of our Exchange, by G. Harold Powell, gives the most definite information for the whole Exchange, viz.: "The f. o. b. average price is 47 per cent higher than the average for 1911–1912." It goes to show that because of this, even though the shipments are only 53 per cent of last year's, the f. o. b. returns equal 79 per cent of the returns of 1911–1912. Of course, this applies to the whole district, not merely our county, but this will give an idea of how the returns compare. I have some figures on the county, but they vary so that I do not consider them suitable for publication. The report in some localities on some kinds of fruit shows some poor and some normal. *Alfalfa*—100 per cent of normal crop. *Apples*—92 per cent crop. *Grapes (raisin)*—80 per cent crop. *Lemons*— 20 per cent of normal crop. *Olives*—55 per cent crop. *Oranges*—75 per cent crop. *Peaches*—95 per cent crop. *Pears*—95 per cent crop. *Prunes*—90 per cent. *Walnuts*—95 per cent crop.—S. A. PEASE.

San Joaquin County:

Peaches, clings—very light crop, about 20 per cent. *Levy clings*—full crop. *Phillips' clings*—very light crop; about 30 per cent. *Muirs*—a fair crop; about 60 per cent. *Lovells*—very light crop; about 20 per cent. *Elberta*—very light crop; about 40 per cent. *Plums (shipping)*—crop about 80 per cent. *Prunes (French)*—crop about 80 per cent. *Prunes (Sargents)*—crop about 30 per cent. *Grapes (wine)* yield from 1,000 pounds to 2½ tons to the acre, and up. *Grapes (table)* taking the county altogether, will not average much over a ton to the acre fit for shipping. *Vegetables* of all kinds are very scarce and high. *Potatoes* are going out at the rate of about 40 cars per day and are of very fine quality. They are yielding from 30 to 200 sacks per acre. General conditions: The dry seasons succeeding each other have resulted in a shortage of moisture to a depth of from 13 to 30 feet, and in many instances orchards not irrigated have not been able to mature the fruit in a normal condition. On the other hand, the dry season has been productive of some good results, in that the orchardists have installed pumping plants, and by the aid of irrigation, have procured good crops, which, in the future, will render them more independent of the rainfall. Another thing which I have observed this summer is that the orchards and vineyards which were irrigated previous to the starting of the growth have proved more satisfactory; first, they have borne the heaviest crops; second, they have not suffered from sunburn, which the late irrigated vineyards have. In my opinion, this sunburn is due to a large extent to a development of a surface root system for which late irrigation is responsible, in that it brings the roots near enough the surface so that, when an extremely hot spell comes, it is the roots that suffer from the heat, and the foliage depending on those roots shows the damage done. As proof of my conclusion, orchards and vineyards which have never been irrigated late, but have been irrigated before the growth starts, and having an abundance of moisture deeper in the soil, and held by thorough cultivation, were not so injured. Trees or vines under the last mentioned condition show no signs of the extreme dry season by sunburn; grapes grown under the last mentioned condition are much finer in quality, size and crop, and are not ready for shipping yet. The peach crop has been very uneven in this county, on account of late frost, some orchards having all the trees could carry, while others had scarcely any fruit.—W. M. GARDEN.

Santa Barbara County:

Alfalfa—crop normal. The alfalfa area is being constantly extended, and the gross product is increasing. *Apples*—Crop 100 per cent actual; acreage of varieties not available. *Apricots*—Crop 100 per cent actual, mostly Royals. *Beans*—75 per cent crop; dry year. *Lima*, 90 per cent, due to irrigation. *Small white*, 65 per cent; dry year; other varieties, 70 per cent. *Cherries*—crop 110 per cent; new bearing trees. *Figs*—crop 100 per cent. *Grapes (wine)*—crop 100 per cent. *Hay*—crop 75 per cent, due to dry year. *Lemons (Eureka, Lisbon)*—crop 96 per cent, due to cold winter. All are setting full and will return to normal, or better. *Olives*—crop 190 per cent, being the fruitful year. *Oranges*—crop 100 per cent. The orange outlook is especially good. *Peaches*—Peaches with us are sold in the fresh fruit market and embrace most of the varieties in all classes. *Peaches (shipping)*—crop 100 per cent. *Pears*—crop 100 per cent. *Potatoes*—crop 90 per cent. Dry year makes crop short. *Prunes*—crop 100 per cent. *Walnuts*—crop 198 per cent. Aphids and blight not so severe as in 1912. A hot wave has damaged nuts 20 per cent in price, not in tons. *General crop conditions*: At one time it looked as though the *apple* crop would suffer from short rainfall, but nothing of the sort has shown up in the crop now being gathered. *Lemons* having been in demand, the returns from crop are greatly in excess of any previous year. I should estimate at least 50 per cent better returns to the grower than previous years. This, with new plantings coming to fruit, makes the income to the county quite considerable. The *lemon* area is being extended quite noticeably, and young trees are coming to fruit, promising much for succeeding years. The *hay* and *grain* crops were short; the hay crop quite normal, owing to many acres usually gathered as grain being cut for hay, the result of dry conditions at time of hay making. Hay prices are 20 per cent higher than usual. The returns from hay and grain are below normal by about 25 per cent. *Beans* are not filling well on dry, sandy land, nor are they doing usually well on adobe that was not worked at its best. Clayey soils are making a poor yield, except where irrigated. Irrigated portions are producing nearly 50 per cent above normal crop. Prices are stiff and buyers eager, making the net returns from all sections quite favorable. *Cherries* are proving remunerative and dependable, and acreage is being extended in cherry districts. *Alfalfa* is increasing in area so rapidly as to make comparison wholly misleading.

Three times the area is now in process of planting of two years ago, while productiveness is gaining, through improved methods of culture and innoculation of seed. The *avocado* industry is receiving much attention and several acres are being planted to this fruit. *Spineless cactus* is gaining a wide planting, but very few, if any, of our farmers have succeeded in getting their stock to take to the new forage. Reports thus far are to the effect that stock has to be starved to eating the food, and they refuse to touch it when other food is available. None seem to form a fondness for it thus far. Even the accommodating hen does not take to it. The general conditions of crops for the year are fully normal, and returns will equal normal. What is lost on short crops is made up in price or by increase on other commodities. The unharvested crops promise full normal returns, with possibly an exception in the bean crop.—C. W. BEERS.

Santa Cruz County:

The *apple* crop has been considerably damaged by the recent hot weather, 15 per cent to 50 per cent, according to conditions. The total output of shipping apples will probably not exceed 600 cars, but culls are abundant—about normal supply. Shipping stock is moving rather freely at $1.00 to $1.25 per box f. o. b., and higher prices are obtained in some cases. Considerable fruit is going into cold storage. The grades of Newtown culls are bringing $9.00 per ton, with drying stock at $7.00. The market conditions are a decided improvement over last year, but the almost total failure of the crop will prevent this district from deriving much benefit. *Beets* are the best crop this valley has this year. The 800 acres in this year are estimated at 11,000 tons. The minimum price is $5.50 per ton, but the average should be between $6.00 and $7.00. The acreage is about twice that of last year and yield is considered normal. *Potatoes* are very poor this year, only a small acreage and very light yield which may be placed at 25 per cent crop. *Berries*, referring largely to *strawberries*, but including *black-* and *loganberries*, have produced heavily this year. Market conditions have been poor and frequently glutted to a serious extent. Prices have ranged from $8.00 to $3.00 per crate, with large quantities going for $4.00 or less. Very small profits and positive losses have resulted. The acreage is on the increase, owing to past records and anticipation of a large market in 1915. The total output this year is about 300,000 crates. *Apricots* were about 66⅔ per cent normal crop, with good prices and fairly free movement. The product of 1,000 tons dry sold from 10¢ to 14¢. *Oranges* were about 50 per cent crop and sold for good prices.—W. H. VOLCK.

Shasta County:

Our fruit crops are all off the trees and vines. The *Winter Nellis* pear crop is not being shipped. The crop was good, as also are the sizes. The *Bartlett* crop was not as good as last year, and much of the fruit was infested with codling moth, which cut the shipping tonnage down considerably. The fruit crop in general was not near normal, that is, in general over the county. In fact, aside from *pears* and *prunes*, there was no fruit crop in the valley proper. The Happy Valley section had a good crop generally, of all kinds of fruit. The *peach* crop was good, but the infestation of peach moth was very bad, and we expect to plan a district and make a general spraying order for all the orchards the coming season, and enforce a clean-up. The prices of the green fruit in that section were 30 per cent to 40 per cent more than for three previous years. Our *hay* and *grain* crops were all good over the country, the Fall River section having a bumper crop. Our *alfalfa* acreage is increasing and there will be quite a planting the coming season. The hay and grain prices range about the same as previous years, with the exception of grain hay, which is 25 per cent higher than last year.—GEO. A. LAMIMAN.

Solano County:

Alfalfa—crop 90 per cent. *Almonds*—crop 65 per cent. *Grapes (table)*—crop 60 per cent. *Peaches*—crop 90 per cent. *Pears*—crop 70 per cent. *Prunes*—crop 75 per cent. *French prunes* and *pears* have been in a demoralized condition the latter part of the season. They averaged smaller than last season. Many fresh prunes shriveled before maturity. *Pears* became half sized—all due to dryness. *Tokay* shipments are very light at present, about one car per day leaving the county. Some new drying prunes, one of which is the *Standard*, have developed well on young trees. They have reached normal size, which is about the size of the Grand Duke plum. *Peaches* at Winters and Suisun are normal in size; at Vacaville they are normal in most orchards, but in some they average very small; in some orchards too small to use.—C. R. MCBRIDE.

Sonoma County:

General conditions of crops for year: The general conditions of crops in Sonoma County for the year are below the average, running from 50 per cent to about normal for *hops* and *grapes*. Returns for crops compared with other years: The financial returns for crops will approximate the average for other years as the higher prices will make up for the shortage in production. General conditions of crops not yet harvested: The late *apples, corn, tomatoes, potatoes, grapes*, etc., are below the average, with the possible exception of wine grapes, which seem to be nearly an average crop.—A. R. GALLAWAY.

Stanislaus County:

Alfalfa—crop 110 per cent, due to more water; returns $10 to $12 per ton. *Almonds*—crop 5 per cent, due to frost; returns 15¢ per pound. *Apples*—crop 100 per cent returns 1c green. *Apricots*—crop 10 per cent, due to frost; returns 2½¢ green. *Beans*—crop 100 per cent; returns 4¢. *Berries*—crop 100 per cent; returns, 8¢. *Cherries*—crop 50 per cent; returns 8¢. *Figs*—crop 125 per cent; returns, 3¢. *Grapes (wine)*—crop 80 per cent; returns, $12 to $14 per ton. *Grapes (table)*—crop 80 per cent; returns $20 to $25 per ton. *Lemons*—crop 50 per cent; trees killed last winter. *Olives*—crop 125 per cent; returns $17 to $25 per ton. *Oranges*—crop 100 per cent;

returns, $1.00 per box. *Peaches*—crop 35 per cent; returns at cannery, green, $12.50 to $25 per ton. *Pears*—crop 75 per cent; returns, $35 per ton. *Plums (shipping)*—crop 100 per cent; returns, 2¢ per pound. A. L. RUTHERFORD.

Ventura County:

Apricots all harvested; yield approximately 1,700 tons of dried fruit, compared with 2,400 tons last season. *Bean* harvest well under way; prospects at present not over 90 per cent of last year. Price from 4½ cents to 5 cents. *Beets* over half harvested, with prospect of normal sugar yield. Prospects for *lemons* for the coming season almost normal. *Oranges,* prospects for the coming season almost normal. Recent hot weather has lowered the estimate on walnuts from 105 per cent of last year's crop to 95 per cent of same. *Walnut* harvest has just commenced.—R. S. VAILE.

Tehama County:

Alfalfa—crop 100 per cent. *Almonds*—crop 10 per cent, due to spring frosts. *Apples*—crop 25 per cent, due to over-production in 1912. *Apricots*—crop 75 per cent, due to dry season and spring frosts. *Grapes (table)*—crop 75 per cent, due to hot weather in early July. *Grapes (wine)*—crop 100 per cent. *Hay*—crop 100 per cent, due to late spring rains. *Lemons*—crop 100 per cent. *Olives*—crop 50 per cent, due to dry season and hot north winds in blossoming time. *Oranges*—crop 100 per cent. *Peaches (drying)*—crop 40 per cent; *Crawford,* crop 40 per cent; *Muir,* crop 40 per cent; *Lovell,* crop 40 per cent; other varieties, crop 40 per cent; due to spring frosts and dry weather. *Peaches (shipping)*—crop 40 per cent; *Alexander,* crop 40 per cent; *Elberta,* crop 40 per cent; other varieties, crop 40 per cent; due to spring frosts and dry weather. *Pears*—crop 10 per cent, due to blight. *Plums (shipping)*—crop 100 per cent. *Prunes*—crop 30 per cent, due to dry season and hot winds in July.—CHAS. B. WEEKS.

Yolo County:

It is too early to give final figures of this season's output of some of Yolo County's principal products, as *raisins* and *prunes* are only partly harvested; *almonds* are now being shipped, and *sugar beets* are to some extent still in the field. *Almonds* are turning out 60 per cent of a normal yield with the exception of *Nonpareil,* which had almost an average yield. *Prunes* are yielding from 40 per cent to 50 per cent; rather shy at that, in localities where no irrigation is practised. *Peaches,* 60 per cent; *Figs,* practically full crop, and *grapes*—for raisins and wine—from 60 per cent to 90 per cent. The large variation of yield is accounted for by the difference in water supply.—G. H. HECKE.

INSECT NOTES.

Conducted by the editor.

Asterolecanium variolosum (Ratz.) has been reported as working upon oak trees at Stockton by Frederick Maskew.

Tomicus confusus Lec. has been sent in by Mr. J. W. Hough from Claremont, Cal., who reported it as doing serious damage to young Monterey Pine trees (*Pinus radiata* Don.) The species was determined by Mr. Charles Fuchs.

A new Kermes has been recently collected in Southern California by the editor and by Commissioner S. A. Pease. Mr. George B. King, who is revising the genus has so made the statement. It works upon the Coast live oak (*Quercus agrifolia* Neé). It was collected by the writer at Santa Paula, Cal., in 1910, and by Mr. Pease at San Bernardino in 1913. In shape it greatly resembles *Kermes nigropunctatus* Ehr. & Ckll., but appears lighter in color.

Eleodes gigantea var. *estriata* Casey has recently been collected at Davis, Cal., by the writer. Dr. Blaisdell states that it has never before been reported so far north.

The billbug injuring small grain, described by Mr. Harry S. Smith in The Monthly Bulletin, Vol. II, No. 8, pp. 619–621, Aug., 1913, is composed of two varieties, according to Dr. Edwin C. Van Dyke, as follows: Those with no white vittæ on the dorsum of the elytra, *Sphenophorus discolor* Mann.; those with white vittæ on the dorsum of the elytra, *Sphenophorus pictus* Lec. According to this classification, the illustrations on page 620 would be of *S. pictus* Lec. or would occupy an intermediate position between the two extremes of the two varieties of one species.

Mealy bugs are reported by Commissioner F. C. Schell as damaging grape vines in his county. Commissioner R. S. Vaile reports an unusual number of young citrus mealy bugs (*Pseudococcus citri* Risso.) this fall.—E. J. VOSLER.

The alfalfa caterpillar, *Eurymus eurytheme* (Boisd.), has been greatly reduced by a wilt disease, according to reports received from Commissioner Carl J. Ley.—E. J. VOSLER.

The Western twelve-spotted cucumber beetle, *Diabrotica soror* Lec. is still damaging squash blossoms in the gardens in and around Sacramento.—E. J. VOSLER.

Crickets are reported eating holes in garments by several parties in Sacramento.—E. J. VOSLER.

The pear-leaf blister-mite, *Eriophyes pyri* Pgst., is reported as now going into hibernating quarters (September 26, 1913) by Mr. Geo. P. Weldon, who observed the young moving from the leaves to the buds and into places of protection. His observations were made in El Dorado County.

NOTES FROM THE COUNTY COMMISSIONERS.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

Humboldt County.

Mr. George Weatherby, County Horticultural Commissioner of Humboldt County, is planning for considerable spraying demonstration work this coming spring. Quite a heavy loss of apples and pears has been occasioned by scab and aphis the past season. Proper spraying at the opportune time should reduce the damage to a minimum. Mr. Weatherby hopes to be able to get such results that those who are careless or negligent with their spraying may see where it is to their advantage to improve their present methods.

Madera County.

County Horticultural Commissioner George Marchbank reports the alfalfa butterfly as being very common in his county, and expresses fears that it may be abundant again next season.

Sutter County.

County Horticultural Commissioner H. P. Stabler of Yuba City, is planning a campaign against the red spider the coming season. This pest has been very destructive to almond, prune, and peach, where no remedial measures have been used.

QUARANTINE DIVISION.

REPORT FOR MONTH OF AUGUST, 1913.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, California.

As is customary, we herewith publish an account of the volume of work accomplished, also a list of the insect pests and plant diseases intercepted at the horticultural quarantine lines in California during the month of August. We have patiently determined the nature and identity of these organisms, and given to them their technical names, for the purpose of an official record. We are well aware that these learned terms refer to subtleties difficult to comprehend, and of very indifferent importance to those most vitally concerned, and we apply them only to satisfy the scientific world that we actually know what we are doing in this matter. What we, as horticultural quarantine officers, are really concerned about, is to prevent any additional entomological or pathological revenue collectors from establishing themselves in California and adding their annual tax to the present cost of crop production.

During all of the month we have pursued the uneven tenor of our way, and in consonance with the simple code of ethics that dominate the service, have passed all horticultural imports that complied with the provisions of the state quarantine law and the regulations of the plant quarantine act; treated, returned or destroyed all such as did not, and have invoked the aid of the law on all violators of the quarantines on fruit fly material. We have found the pupæ of flies in the folded tops of automobiles, and as a result, have drafted and urged the passage of a regulation preventing in the future any motor car arriving from Hawaii from leaving the dock upon which it was landed until the same has been inspected and passed by the quarantine officers. We have formulated a policy of action looking to the working in unison of the great interior quarantine service of the State with that of the coast division and the collaborators of the United States Department of Agriculture, and which, if successful, will eventually give to California the most complete horticultural quarantine system of any country in the world.

SAN FRANCISCO STATION.

Horticultural imports.

	Parcels.
Ships inspected	37
Passed as free from pests	44,363
Fumigated	2,929
Fumigated and returned	498
Destroyed or returned	159
Contraband destroyed	45
Total parcels horticultural products for the month	47,994

Horticultural exports.

	Parcels.
Inspected and certified	4,813

Pests Intercepted.

From Honolulu—

Fruit fly larvæ and eggs in string beans.
Dipterous pupæ in folded top of automobile No. 1072.
Bruchus sps. in seed pods.
Diaspis bromeliæ and *Pseudococcus* sps. on pineapples.
Cylas formicarius and *Cryptorhynchus batatæ* in sweet potatoes.
Lecanium sps. and aphids on betel leaves.
Ceroplastes sps. on plants.

From United States Hawaiian Experiment Station—

Diaspis echinocacti on *Opuntia* sps.
Asterolecanium sps., *Pseudaonidia* sps., *Coccus longulus* and *Saissetia nigra* on Hibiscus cuttings.
Pseudaonidia sps., *Howardia biclavis* and *Chrysomphalus aurantii* var. *citrinus* on Jasmine plants.
Fungi on sweet lime cuttings.

From Tahiti—

Chrysomphalus aurantii, Morganella maskelli, Lepidosaphes beckii and fungi on oranges.
Hemichionaspis minor on cocoanuts.
Chrysomphalus dictyospermi and *Icerya seychellarum* on mango trees.

From New Zealand—

Leucaspis sps., *Eriococcus* sps., *Aspidiotus* sps., and *Saissetia oleæ* on *Podocarpus ferruginea* and *Myrtus bullata.*

From China—

Ephestia elutella on walnuts and peanuts.
Pseudaonidia trilobitiformis, Chionaspis citri, Aspidiotus sps., *Lepidosaphes beckii* and *Phomopsis citri* on pomelos.

From India—

Lepidopterous larvæ and coleopterous larvæ in Cashew kernels.

From Japan—

Aleyrodes sps. on plants.

From Belgium—

Diaspis echinocacti on *Opuntia* sps.

From New Jersey—

Diaspis boisduvalii on orchids.

LOS ANGELES STATION.

Horticultural imports.

	Parcels.
Ships inspected	20
Passed as free from pests	19,034
Fumigated	14
Destroyed	3
Returned	--
Contraband	--
Total parcels horticultural products for the month	19,051

Pests Intercepted.

From Florida—

Saissetia oleæ on avocado tree.

From Kentucky—

Pseudococcus citri on unidentified plant.

From Illinois—

Pseudococcus citri on unidentified plant.

From Massachusetts—

Chrysomphalus biformis, Chrysomphalus ficus.
Chrysomphalus perseæ, Diaspis boisduvalii.
Diaspis echinocacti and *Lepidosaphes* sps. on orchids.

From New Jersey—

Pseudococcus citri and *Pseudococcus longispinus* on crotons.
Aspidiotus hederæ, Chrysomphalus ficus and *Pseudococcus longispinus* on Kentia palms.
Orthezia insignis on Rhapis palms.

SAN DIEGO STATION.

Horticultural imports.

	Parcels.
Ships inspected	30
Passed as free from pests	1,277
Fumigated	--
Destroyed	1
Returned	--
Contraband	14
Total parcels horticultural products for the month	1,292

SANTA BARBARA STATION.

Ships inspected 1

No horticultural imports.

EUREKA STATION.

No report.

A FORTUNATE FIND.

By Lee A. Strong, State Horticultural Quarantine Inspector.

Probably nothing in the annals of the Quarantine Division has served to so vividly show the imminent danger and consequent disastrous results of the introduction into California of the Mediterranean fruit

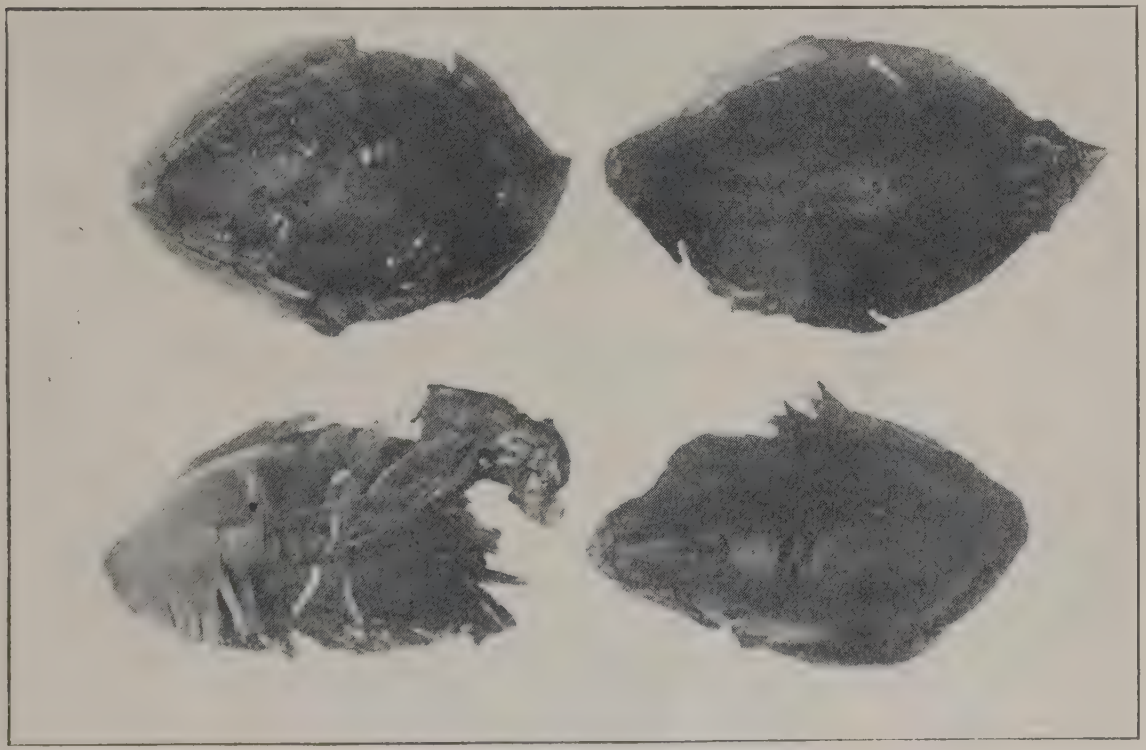

Fig. 380.—Kamani nuts infested with living larvæ of the Mediterranean fruit fly (*Ceratitis capitata* Wied.), destined for planting in Southern California, but confiscated and destroyed by the author. (Photo by Chatterley.)

fly (*Ceratitis capitata*) as the following incident which occurred on the arrival in San Francisco of the Oceanic Steamship Company's steamer "Ventura" on April 25, 1913, from the antipodes via Honolulu, T. H.

During the regular procedure of baggage inspection by the United States Customs authorities, the writer was called by Customs Inspector Graham to pass upon several lots of Algoroba beans among a number of child's toys in a small telescope bag. These beans, not being a host of the fruit fly, and showing no sign of insect infestation, were passed, and the passenger was asked whether she had anything more in the way of seeds or fruit. She replied that her husband had in his pocket five seeds of the "Hypocrite tree," grown in a churchyard in Honolulu. She also stated that they contained no insects, as her little daughter had played with them in the cabin during the voyage from Honolulu, and had there been any maggots or other insects in them they would most certainly have been discovered; that the beauty of the tree so impressed her, she wished to grow some like it, and was taking the seeds to southern California to be planted.

Upon examination, the seeds proved to be the "Kamani nut" or "tropical almond" (*Terminalia cattapa*), a hard nut, very like in form to an almond (Fig. 380), but slightly larger, with a thin, fibrous covering, and one of the favorite hosts of the fruit fly. On turning back the covering of one of the nuts there were disclosed to view eleven Mediterranean fruit fly maggots, subsisting on what appeared to be scarcely enough food for one.

Had not these seeds received the rigid inspection given everything from all localities where fruit fly exists, they would undoubtedly have been planted in southern California, and since the fruit fly, when possible, enters the ground to pupate, nothing—had it been carefully planned—could have been so conducive to the establishing in California of the most dreaded and worst known insect pest of fruit and vegetables in the world today; an insect that has the widest range of host fruits of any known, and whose presence in a fruit growing region means devastation and ruin.

COUNTY HORTICULTURAL COMMISSIONERS.

By Frederick Maskew, Chief Deputy Quarantine Officer.

The central quarantine office is mainly concerned with the County Horticultural Commissioners in their capacity as State Quarantine guardians, but the experience of half a life time, spent in the orchards and fields of California—most of the same working in conjunction with the county officials upon local problems—created a lasting feeling of interest and fellowship in all that pertains to the success of their several functions. It is with much pleasure that we have read the press comments of the exhibits made by the Horticultural Commissioners at the county fairs that have recently been held in different parts of this State.

We have long held, and often set forth, that an active working horticultural commissioner was one of the best assets any county could possess, and in our opinion, an annual fair where the most progressive of its citizens are striving to advance the interests of the county, is one good place at which to demonstrate the same, and with an energetic

man in charge, it would be difficult for any other county office to rival it in point of general usefulness.

"Horticultural Commissioner." The title itself implies the possible scope of the service of the office to the producers of any county in California. Applied entomology is one of the phases, but the requirements of the position in its broadest sense call for a knowledge of the soils of the locality and their adaptability to the production of specific crops; the best means of maintaining and increasing their productivity and the most economical methods to be employed to make the same fully available; the varieties of different fruits suited to the particular environment as well as the commercial requirements for the same; a working knowledge of the different grades of nursery stock and their relative values, as well as the principles of laying out and planting an orchard and the subsequent general management of the same; and above all, the ability to assimilate technical findings on all these subjects and adapt the most economic ways and means of applying the same to the immediate conditions of his own county.

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ZEBRA CATERPILLAR.

(*Mamestra picta*, Harris.)

Order—Lepidoptera. Family—Noctuidæ.

By E. J. Vosler, Assistant Superintendent, State Insectary.

The zebra caterpillar, *Mamestra picta*, often attracts attention by appearing in considerable numbers in the early fall on alfalfa.

Comstock[1] describes the caterpillar as of a light yellow color with three broad longitudinal black stripes, one on each side and the third on the top of the back. These stripes on the sides are broken by numerous pure white lines. The pupa is of a brownish color. The

Fig. 381. — Alfalfa stems showing larvæ and webbing effects of *Mamestra picta*. (Photo by Reeves.)

adult moth has dark chestnut brown forewings and pale yellow hindwings.

The eggs of this caterpillar are deposited on the alfalfa leaves and hatch in a few days. The young larvæ eat the epidermis of the leaves, which soon appear whitish from their attack. They web the tops of the stalks of alfalfa together, as shown in Fig. 381.

One may go through an alfalfa field and notice here and there plants of which the tops are webbed together and the leaves present a whitish and dead appearance. In the young stages the larvæ work in colonies, and only on the upper and consequently more tender portions of the

[1]Manual for Study of Insects, page 305.

alfalfa plant. I have seen as many as fifty small larvæ on one leaf and several hundred on the entire plant. As they become larger they will scatter to adjoining plants, eating the leaves as they go. Fig. 382 shows a larva of *Mamestra picta* destroying the leaf tissues of the alfalfa. Often at a radius of several feet from the originally infested plant the larvæ may be found working on the leaves.

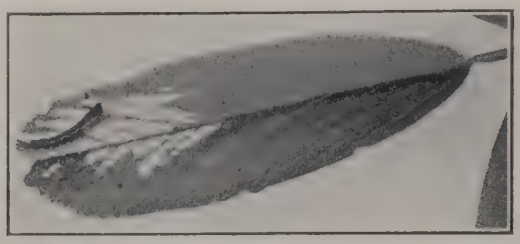

FIG. 382.—Larva *Mamestra picta* on an alfalfa leaf. (Photo by Reeves.)

An interesting note in connection with the feeding habits of this caterpillar was observed in an alfalfa field at Salt Lake, Utah. During the latter part of September and the first of October, when the alfalfa leaves were becoming too tough, the larvæ would migrate to the edges of the field and feed on the tender growth of dock, which was very abundant along the ditch banks. Day after day the larvæ were picked off the dock, and each time a new number of well grown larvæ appeared.

From September to October the caterpillars on becoming full grown enter the soil to pupate. In the breeding cages a majority passed the resting stage at a depth of from 4 to 6 inches. The winter is passed in this stage, the moths appearing in the spring. There are probably several generations, but the last generation in the fall is the one in which the larvæ are numerous enough to attract attention.

At present the best method for the control of this pest on alfalfa is to go through a field picking and destroying infested tops, which are conspicuous because of their whitish color, when the larvæ are in the young stages and consequently massed on one or two stalks. If the fields are pastured at this time of the year very little damage will result from this insect's attack.

FIG. 383.—Cocoon of *Campoplex* sp. on alfalfa stem with the larval remains of *Mamestra picta*. (Photo by Reeves.)

We have records of this insect occurring in the Atlantic States, Colorado, Utah and California.

Besides alfalfa, it attacks cabbage, celery, beets and other garden vegetables.

Very few natural enemies have been recorded on this caterpillar. An undetermined species of a tachinid fly has been reared from *Mamestra picta*. A species of *Campoplex* of the family *Ichneumonidæ* was reared from the young larva of *Mamestra picta*, at Salt Lake, Utah. The *Campoplex* oviposits in the very young larva and emerges from the host at about the third stage, spinning its cocoon below the host remains. Fig. 383 shows the cocoons of this parasite and the remains of the host.

INJURY AND PROTECTION OF FRUIT FROM FREEZING.

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

One of the chief limiting factors in the production of fruit throughout the various states of the Union is frost. It is true that there are certain sections of the country where such have seldom or never occurred to the detriment of the fruit crop. Experience of orchardists in California and elsewhere has led to the conclusion that no section, no matter how free it has been from killing frosts during the danger period of trees in the past, can be said to possess immunity, and there may come a time when the temperature will drop so low that buds, blossoms and fruit, if not trees, must succumb. There are, of course, many places where fine fruit is grown during favorable seasons that are visited by killing frosts periodically, and the chances for and against raising a crop are about even. Such sections do not offer the best advantages for commercial orcharding unless some practical means of protecting the crop during the danger period may be employed.

Period of Greatest Danger from Killing Frosts.

In the case of deciduous fruits, the injury is usually done either to the buds, blossoms or small fruit in the early spring, about blossoming time, although a severe freeze during the winter season may kill the buds. In the case of citrus trees, freezing temperatures any time during the winter or spring season may result in the destruction of the fruit, while the buds of well-ripened, perfectly dormant deciduous trees will often stand temperatures ranging from 10° to 30° or more below zero. The period of greatest danger, as far as deciduous fruits are concerned, corresponds pretty closely to the time from when the buds begin to swell in the spring until the fruit (apples or peaches) has reached a diameter of a half inch. This time is, of course, subject to variations in climate, due to altitude or local conditions.

Bud Injury.

Winter or early spring injury to buds may be detected by a discolored area seen in the center upon cutting them open. The pistil or central organ of the blossom is usually the first part to freeze and once frozen fertilization is rendered impossible. Blossoms so injured will sometimes develop, and the trees will come out in blossom and be just as beautiful as if nothing had happened. An examination of such blossoms will show the blackened pistil in the center, and if any fruit develops, it must be from blossoms which escaped this injury or which developed later. A peculiar form of freezing of apple blossoms which has come to my notice in another state destroys the petals entirely. The rest of the parts of the blossom develop normally; fertilization takes place as usual, and a good crop of fruit may set on the trees.

Fruit Injury.

Often fruit develops from frost-injured blossoms, but probably never except when fertilization has taken place prior to the injury. It is a very common thing to find seedless apples or pears during a season following a freeze at blossoming time or shortly afterward. Fig. 384 is

FIG. 384.—Normal shaped Bellflower on right; abnormal Bellflower on left because of frost injury. (Original.)

FIG. 385.—Normal shaped Bellflower on right contains well developed seeds; abnormal frost injured Bellflower on left has none. (Original.)

a picture taken of two Bellflowers picked from the same tree. One apple is almost true to the type of this particular variety; the other is very much flattened and distorted. Most of the apples in the orchard where these were picked resembled the latter, and it was difficult to find

a typical-shaped Bellflower. All apples of this shape were seedless. This trouble might easily be confused with distortion of apples from the attack of purple apple aphis. This pest always leaves the apples small and misshapen, but well-formed seeds are present. Fig. 385 shows the same two apples as in Fig. 384, which have been cut open. A well-developed seed is shown in the core of the typical-shaped apple, while the other one has none. Figs. 386 and 387 show distorted Bartlett pears which were injured by a spring freeze and which have developed no seeds.

Another form of injury to fruit is the so-called frost russet illustrated in Fig. 388. The russeting very frequently shapes itself in a band about the fruit, but in some cases may occur in the calyx and stem cavities. This injury is very commonly confused with that resulting from thrips or blister mite on pears, and scab or Bordeaux injury on both pears and apples and various other things. The presence of the characteristic bands as illustrated is a sure indication of frost injury.

Leaf Injury.

A peculiar crumpling or blistering of the leaves of deciduous fruit always follows severe spring freezes. The epidermis of the leaf may separate from the inside portion wherever these blisters occur. Such leaves are apt to turn yellow and drop very early in the season. This form of injury is not serious.

Susceptibility of Varieties.

Some varieties of apples, pears, peaches, cherries, as the case may be, will stand much more freezing than others. Again, some varieties will blossom much later than others, thus escaping a frost that would injure earlier blossoming varieties. It is, therefore, wise for the orchardist who lives in sections of killing spring frosts to select the hardiest, and in some cases preference should be given to late blooming varieties. As an illustration of this fact the Rome Beauty and Jeniton apples blossom much later than the Ben Davis and Jonathan, consequently often escape injury when the latter-named varieties are killed by a freeze coming about blossoming time.

Frost Protection.

It is safe to say that the orchard which is well cared for in general is less liable to injury from freezing than the one which is neglected. The first point which should be emphasized, then, in connection with protecting the orchard from killing frosts is proper care. Cultivation, pruning, fertilization, irrigation and spraying are all necessary at certain times for the best development of trees, including the fruit buds. If the buds can go into the winter in perfect condition, there is every reason to believe that they will stand more than they would if devitalized because of unhealthy trees.

Smudging.

It has long been known that there is little danger from killing frosts on a cloudy night. This fact has led to a belief that the same protection afforded by the clouds can be produced artificially by means of smoke. With this idea in view, various materials which in burning will produce much smoke have been burned in orchards during frosty nights. This

method of protection is known as smudging, and is fast giving way to the better method of heating. It is probable that light frosts have been warded off by means of such smudges, or at least a sufficient blanket has been formed over an orchard in the early morning to prevent the rapid

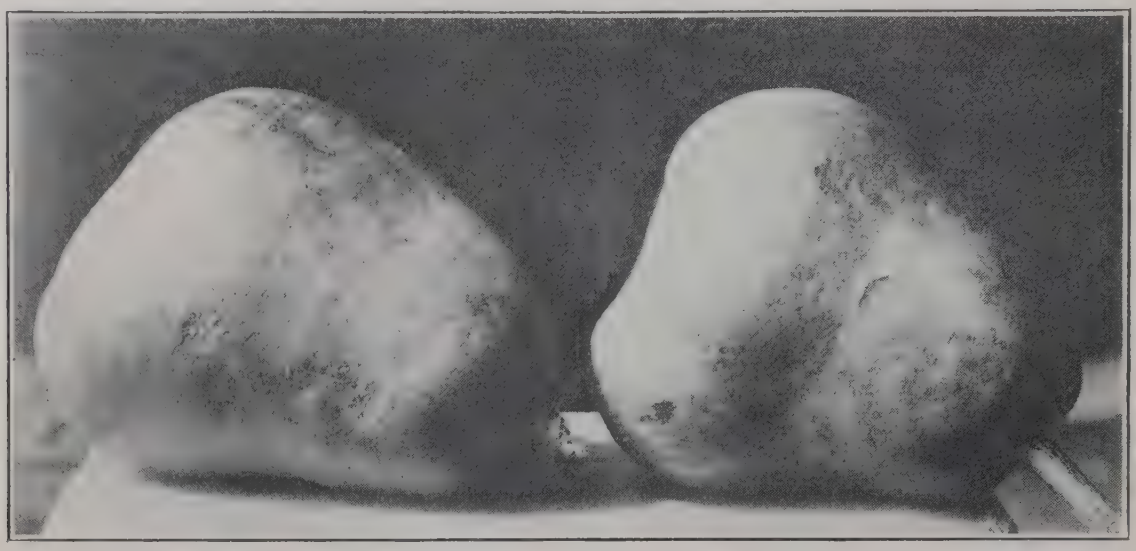

FIG. 386.—Poorly shaped Bartlett pears injured by freezing. (Original.)

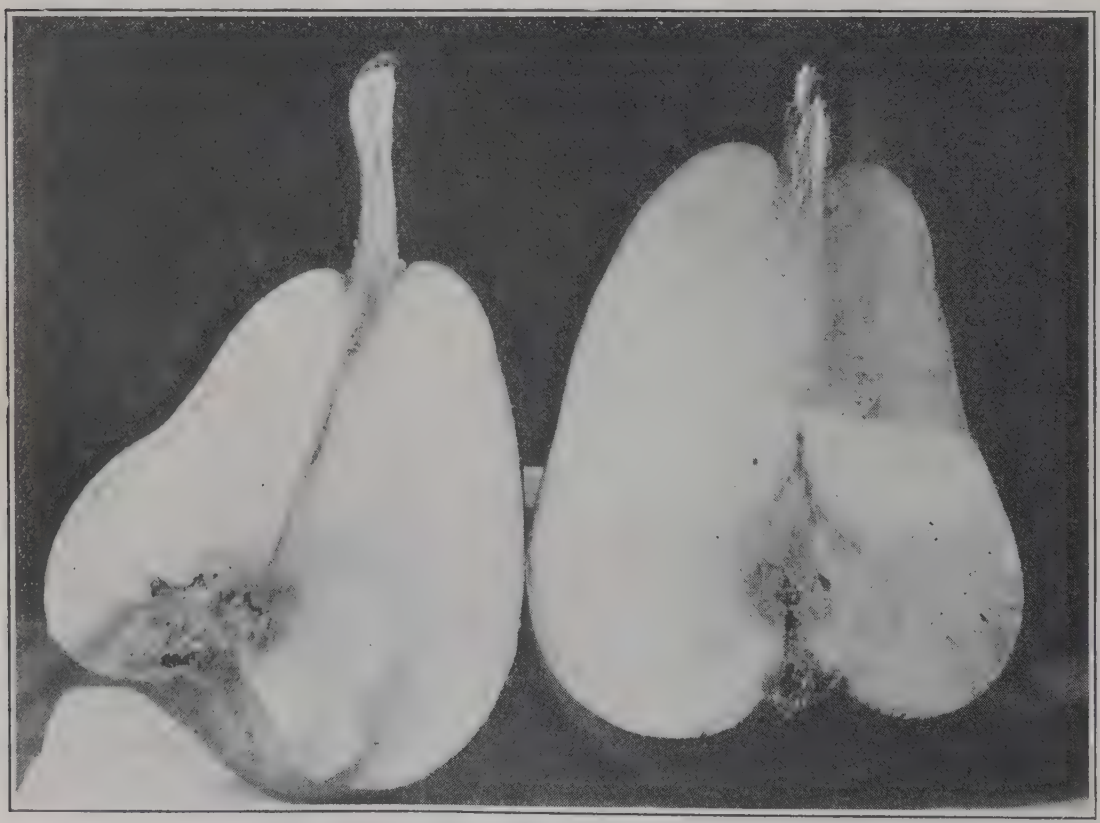

FIG. 387.—Pears shown in Fig. 386 cut open to show that they are seedless. (Original.)

thawing of the blossoms which, if thawed out too rapidly, are sure to be killed. It is now thought that smudging in itself is of little value, and many of the successful orchard heaters now in use are designed to utilize as much of the fuel as possible; the more complete the combustion the better they are thought to be.

Orchard Heating.

While there are still many problems in connection with orchard heating yet to be solved, it is now generally conceded that, under certain conditions at least, a crop of fruit, citrus or deciduous, can be saved, even though the temperature falls as much as 15° below freezing. During spring freezes of four different seasons in Colorado, the writer had abundant opportunity to study the various operations of the orchard heating business in time of action, and the effect of such heating in saving fruit. The first practical demonstration of what could be accomplished was made in the spring of 1908. Three or four different parties had previously purchased some of the Bolton orchard heaters, which at that time were manufactured in California. By the use of these small lard-pail pots, as they were called, which held about three quarts of oil, these men succeeded in saving a considerable amount of fruit. The demonstration was a perfect one, for only in the heated areas was there any fruit. Before this time there were orchards in California

FIG. 388.—Frost russet band of apples. (Original.)

where heaters had been used. The Limoneira Company had done considerable work along this line, and had used wire baskets for burning coal with more or less success. The fact that it was possible to save a crop of fruit by burning coal or oil in containers led to the making and patenting of a great many types of heaters, practically any one of which will do the work, provided that the necessary amount of fuel is burned. Both coal and oil have given satisfaction, but the latter is preferred by most orchardists. In California, where oil is so cheap and coal so high, it does not seem as though any one would be justified in purchasing coal heaters. It would not be policy to recommend any particular make of heater in this article. In general, the reservoir type of oil heater is the most satisfactory. One can scarcely afford to purchase heaters and other equipment for the work and then fail because of an insufficient supply of oil. Of course, it is possible to refill small heaters, or to have a reserve supply of them on hand, but such entails extra work and expense at time of heating when it is often hard to get enough help.

Placement of Heaters in Orchard.

One heater for each tree is the number ordinarily used. They are commonly placed in the center of the rectangle formed by four trees.

When to Light.

Firing should begin before the temperature has reached the danger point, the object being to keep it at a certain point rather than to let it drop below and then try to raise it again. For example, it is much easier to maintain a temperature of 32° when the outside temperature is 25° than it is to raise it to 32° after it has dropped down to 25°. While fruit buds or blossoms may stand this temperature for a short time, it is never safe to let it get so cold.

Keep Firing Well After Sunrise.

Many a crop of fruit has been lost because fuel played out, or because men became tired or careless and let fires go down at daybreak. The coldest period is very often about sunrise and the heaviest firing is necessary at this time.

Use Only Tested Thermometers.

To depend upon a twenty-five cent thermometer in the orchard-heating business, when thousands of dollars are at stake, is inexcusable foolishness, and yet such has often been done. Nothing but reliable, tested thermometers should be used in this important work. Several should be used and placed in different parts of the orchard, as there may be quite a temperature variation in a short distance. Electric alarms may be used, but it is more satisfactory in actual practice to have reliable men to watch the thermometers and record temperatures every few minutes during the time of expected freeze.

Success Means Hard Work.

Our present knowledge of frost fighting with orchard heaters is not such that it can be recommended under all conditions. With the temperatures that we usually have during the period of spring and winter freezes in California, it is safe to say that the man who is willing to observe all the details and who is not afraid of the hardest kind of work will succeed. Not every man who has orchard heaters does, neither does every man who sprays make a success of that operation. Orchard heating, if it is done at all, should be done rightly, or else all labor and expense may be thrown away. No one who is looking only for the easy jobs should have anything to do with this work.

REPORT OF DOCTOR G. HAROLD POWELL, MANAGER OF THE CALIFORNIA FRUIT GROWERS' EXCHANGE.

By A. J. Cook, State Commissioner of Horticulture.

This report is full of encouragement. It shows the value of this great co-operative association, demonstrates completely success in what was at first thought to be a most serious calamity, and must give to all citrus growers renewed courage.

The estimated crop at the beginning of the year, September, 1912,

was thirty-four thousand carloads, or 13,250,000 boxes. Never before was the estimate so large.

The heavy November winds destroyed ten per cent of the crop, and the unprecedented freeze of January, 1913, still further reduced it, so that only 12,445 carloads were sent to market. We see by this that over 60 per cent of the crop was destroyed.

This colossal misfortune was heralded throughout the country, and without the Exchange the showing given in this report would not have been possible.

As a result of the double loss, only 37 7/10 per cent of the estimated shipment for the year was sent to market by the Exchange. This amounted to 61⅓ per cent of the total shipment from the State during the season. Indeed, it surpassed the percentage of any previous year. In 1905 the Exchange marketed only 47 per cent of the total crop, but has speedily increased from that time until now.

The freeze of course resulted in a shortage of citrus fruits, and so prices ruled high. The cash returns exceed $13,500,000, an average of $2.75 per box. This is 50.2 per cent higher than the average for the past eight years.

It will be remembered that Mr. Frank F. Chase, of Riverside, discovered a method of segregating the frozen and unfrozen fruit. It is a gratifying fact that only one third of one per cent brought "red ink" returns. Notwithstanding the great freeze, 98.25 per cent brought a cash return after all expenses were paid. The one third of one per cent were probably those sold immediately after the disastrous frost.

The total cost of marketing each box of fruit the present season was 7⅓ cents, or only 2 per cent of the gross sales. This is 16 per cent less than that of the previous year, owing to better prices this present season. Surely, farmers can do business. This, however, is only the cost of maintaining the central exchange. If we add the cost of maintenance of the district associations, the entire cost is less than 2⅔ per cent of the gross sales. Doctor Powell adds that this is less than the cost of marketing any agricultural product in America other than this. The usual cost is not less than 5 per cent and more often reaches 10 per cent or even more.

The total losses during the year from bad debts, etc., were $380.70, or less than 1/333 of one per cent, of the cash returns to the growers. Since 1904 the net returns paid by the Exchange to growers has been $131,000,000; the total losses $5,731.21, or less than 1/200 of one per cent. Does this not show that farmers can do business? Co-operation has won out.

The shipments this season after the disastrous freeze were 53 per cent of those of the previous year, and the f. o. b. cash proceeds 79 per cent. After deducting all expenses of whatsoever kind, the growers received 85 per cent of the amount paid them the previous year. The f. o. b. average price this season was 47 per cent above that of last season. So well was the business conducted by the Exchange that though the amount of fruit sold was so greatly reduced, yet the cost to the growers was only ¾ of a cent per box above that of last year.

A SERIOUS PHILIPPINE ORANGE MOTH.

Prays citri Mill.

(*Prays nephelomima* Meyrick.)

By E. O. Essig, Secretary State Commission of Horticulture.

Prof. C. F. Baker[1] continues to show his keen interest in the protection of California horticulture by his many reports to the State Commission of Horticulture relative to the serious insect pests in the Philippine Islands, which should be intercepted in quarantine. Of all enumerated, he has called particular attention to a small moth, concerning which he writes: "The little moth works in a variety of native orange here, called the 'cajel.' It practically makes a gall in the rind, causing a tumor-like swelling that is always open at the outside, and which does not seem to penetrate the pulp at all. I get large and small moths from these galls. It is apparently a new pest of oranges and

Fig. 389.—Rind of "cajel" orange showing tumors made by the larvæ of *Prays citri* Mill. Twice enlarged. (Original.)

seems to be widely distributed, and should be taken account of in quarantine work. The determination, *Prays citri* Mill., of which *Prays nephelomima* Meyrick is a synonym, came through Busch from Meyrick himself."

The larvæ of this moth live just beneath the rind next to but not in the pulp. They produce gall-like tumors, which remain opened at the tips. (Fig. 389.) These tumors are often exceedingly numerous and may almost cover the entire surface of the orange. Both the appearance and keeping qualities of the fruit are thus destroyed, as the openings

[1]Professor of Agronomy, College of Agriculture, University of the Philippines, Los Baños, P. I.

are very repulsive to the sight and afford excellent germinating places for destructive fungi, which are always abundant. The tumors are often scarcely perceptible in height, while many protrude one fourth of an inch. The opening is usually about one eighth of an inch in diameter. The larvæ are small, rarely attaining a length of more than one fourth of an inch. They are light yellow or whitish, and have the head, two small spine areas on the dorsum of the prathorax, two similar areas on each of the mesothorax and metathorax, and the tip of the abdomen dark brown. The body is covered with many colorless hairs, which are not visible to the unaided eye.

The adult moths,[2] as previously stated by Prof. Baker, are of two distinct sizes, the largest being three eighths of an inch long and the smaller about half as large. The general color is light grayish-brown, with large and distinct dark marking upon the front wings. The body, legs and antennæ are light, as are the hind wings, which have large marginal fringes. Under certain lights there is a bright blue iridescence to the color of the wings and body.

As there is apparently no way of importing this pest except with the fruit, the danger of introducing it to California is greatly reduced by the quarantine laws which are being maintained against all countries where the fruit flies (*Trypetidæ*) are known to exist. However, the recognition of such a pest by quarantine inspectors may prevent its introduction from some other section of the world where these laws do not apply.

[2]The material from which these descriptions are made was furnished by Prof. C. F. Baker.

GENERAL NOTES.

AN INTERESTING INTRUDER.

When we remember that there are more insects, probably more beetles (*Coleoptera*), than there are of all other species of animals of all the groups, we may not wonder that the student of this class of animals is constantly running against surprises. An insect puzzle has just come to us here. Mr. S. H. Essig, Horticultural Inspector of Ventura County, sends in a large number of snout beetles, or weevils, which were found doing no little damage to the tender foliage of the apricot trees. These prove to be otiorhynchids, or not very distant relatives of Fuller's rose beetle, *Aramigus fulleri*. This, strange as it may seem, is a species entirely new to science, so far as we can determine. The puzzle is just here: How could a new species come upon us all at once in large numbers? Is it an importation, or has it come upon the apricot from some wild plant of our own State? In either case we should suppose that some keen-eyed entomologist would have "spotted" it before this.

It will be remembered that Fuller's rose beetle was discovered only a comparatively short time ago. Yet it is now a pest to be reckoned with, both as a larva and as an imago.

Fortunately this new pest does not come till midsummer, when the season's growth is well advanced, and so partial defoliation is less damaging than earlier in the season.

The larvæ of *Aramigus fulleri* feeds upon the roots of roses, raspberries, blackberries and other rosaceous plants, and often does serious mischief. It will be interesting to know where this new pest works in the larval or grub stage.

A word as to remedial measures against this new pest. In case the larva works on the roots of cultivated plants then bisulphide of carbon, which has been used successfully against the grubs of Fuller's rose weevil, would doubtless serve as a remedy. It is a well-known fact that most weevils when jarred fall to the ground, and that all leaf-eaters are poisoned by use of lead arsenate as a spray. By use of the jarring method—trapping the insects—I saved my plum crop in Michigan entirely for years, while neighbors who gave no heed to the Curculio lost all. Lead arsenate, three pounds to fifty gallons of water, is a cheap, effective poison. This is a mixture and not a solution, and so should be stirred so as to keep it uniform. In case insects are very numerous, this last may seem to be ineffective, as the multitudes killed by the poison are at once replaced by other multitudes ready to take their place and meet their fate.

This often happens when we use the arsenical mixtures to kill the rose chafer, *Macrodactylus subspinosus*, of the eastern states. In all such cases, where we use poisonous sprays, we must apply with force so as to reach all the foliage.—A. J. Cook.

A NEW METHOD OF DESTROYING WOOLLY APHIS.

M. A. Cadoret, of France,[1] has discovered a new method of destroying woolly aphis on fruit trees. It consists in painting the attacked parts with a mixture composed of:

Linseed oil	7 pounds
White lead	1½ pounds
White zinc	1 pound
Turpentine	1 pound

Boil together the first three for ten minutes and allow to cool, after which add the turpentine and apply with brush in spring and autumn.

In many sections where large knots are produced by this pest, it might be well to give this method a trial yet this year.—E. O. Essig.

THE ROSE APHIS.

In the Review of Applied Entomology, Series A, Vol. I, Part 8, page 271, 1913, there is a review of some experiments on the rose aphis, conducted by T. Peneau in France. He calls particular attention to the destruction of the eggs in winter by painting the stems with lime or with a mixture of quicklime 5 parts, sulphate of iron 3 parts, water 50 parts (all by weight). A mixture which he claims is better than either of the above is called Melange de Balbiani, and is made as follows: Dissolve 7 pounds of naphthaline in 5 pounds of coal tar; add 24 pounds of slaked lime; gradually add water until there are 10 gallons of spray. These materials are applied in June.

It might be well to experiment with the last spray as a means of destroying the eggs of the rosy and green apple aphids, which are so serious in California.—E. O. Essig.

THE WATSONVILLE APPLE SHOW.

The exposition at Watsonville, October 6th to 14th, was a pronounced success. The pageantry feature was strikingly attractive; the feature exhibits most original, very ingenious and, like the pageants, must have required days of hard work. These were in the hands of the school children of the county, and the writer has rarely, if ever, seen anything to equal them. The wholesome attractions other than the exhibits warranted the exceptionally large attendance.

A noticeable reform over the exhibit of last year was the omission of carload lots. Is it not much more important to exhibit single boxes, five- and ten-box displays, as these attract the attention of the small grower and growers rather than of the dealers?

Messrs. Rowe of Michigan and Olwell of Rogue River Valley, Oregon, who acted with the writer as judges at the Exposition, commented very favorably upon the quality of the fruit. Mr. Rowe, who has acted as judge at all of these Watsonville expositions, stated that there was a marked improvement each year, which gives clear warrant to such exhibitions, costly though they may be in time and money.

Two peculiarities of this Apple Show are most interesting: One, the splendid apples coming from our mountain counties where the altitude

[1]Rev. Appl. Ent. Vol. I, Ser. A, Part 8, p. 274, Aug., 1913.

is high and the winter temperature low. Especially fine was the exhibit from Inyo County. One of the judges remarked that everything in that exhibit should take a prize. The display from Humboldt County was also greatly admired. Second, the diversity of products which we can get almost in any county of California.

In an automobile drive we noticed some of the orchards excellently well-cultivated; others, not so. These last, with a large growth of weeds, were certainly losing great quantities of water, carried off by transpiration, which they could illy afford to lose.

Evidently many props had been used to hold up the great crop and to prevent breaking of branches. Would not more attention to pruning and thinning of fruit do away with this necessity of using props, and so permit cultivation and destruction of weeds?

It is certainly true that this year's display of exhibits at Sebastopol and Watsonville fully demonstrates the value of such expositions.—A. J. Cook.

TWO SPRAY FORMULÆ FOR FRUIT FLIES.

In the work of controlling the olive fruit fly in France, S. Scelsi[1] gives two important spray formulæ which have become very noted in that country, and which may prove of value in the control of the few fruit flies known in this country. They are as follows:

[1]Review of Applied Ent. Vol. I, Ser. A, Part 8, p. 271, Aug., 1913.

Berlese Formula.

Molasses	20 pounds
Arsenate of potash	4 pounds
Water	20 gallons

De Cillis Formula.

Molasses	130 pounds
Honey	62 pounds
Glycerine	4 pounds
Arsenate of soda	4 pounds
Water	20 gallons

The spraying should be done thoroughly, great care being taken to see that all of the leaves are wet.—E. O. Essig.

SOME INTERESTING FRUIT FLIES.

Prof. C. F. Baker has made some remarkable discoveries in the Philippine Islands with regard to fruit flies, which are worthy of note here. The melon maggot, *Dacus cucurbitæ* Coq., is abundant there. *Dacus ferrugineus* Fab., as has been previously reported there, proves to be *Dacus ferrugineus* var. *pedestris* Bezzi. The most interesting fly, the maggots of which he found swarming in wild oranges, proved to be a new genus and a new species which Bezzi named *Monacrostichus citricola.*

Prof. R. W. Doane, of Stanford University, has recently collected the Queensland fruit fly, *Dacus zonatus* Coq., on the Island of Tahiti.

Specimens of all the above species are in the collection of the State Commission of Horticulture.

All of these fruit flies are serious pests, so these records are of great value to the horticultural quarantine departments of the state work.—E. O. Essig.

CALIFORNIA NURSERYMEN'S CONVENTION.

The meeting of the California Nurserymen was well attended, and the program very interesting and instructive. One rarely listens to so excellent a program.

The large attendance of county horticultural commissioners was very gratifying. The mingling of these commissioners, the fruit growers and the nurserymen, will tend toward that harmony of thought and feeling which is indispensable to the best practice.

We have only to know our Californians in each of these classes to feel sure that any want of accords results from lack of acquaintance. Such meetings will aid greatly to secure uniform horticultural laws, ordinances and practice.—A. J. Cook.

FORMULÆ FOR PRESERVING FRUIT.

The specimens to be preserved should be the most perfect obtainable, free from all blemishes and imperfections. In most cases fruit of a fair degree of ripeness is better than partly green specimens.

Exhibition jars should be of clear, white glass, preferably with ground glass stoppers. The tall cylindrical form is desirable, especially for the smaller fruits.

The sorted fruit is first carefully placed in the jar, which is then filled with clear water. After standing a short time, the water should be poured off, so as to remove all particles of dirt from the jar and contents. The jar may then be filled with the preserving fluid and kept in a dark, cool place until the time for exhibition. Frequent examination should be made to determine how well the fruit is keeping. If the liquid becomes colored from the fruit, it should be poured off and replaced by fresh fluid.

The following formulas have been successfully used at the Colorado Agricultural College, especially with plums, grapes, cherries, currants and gooseberries:

Formalin, 5 parts; saturated solution of common table salt, 10 parts; water (boiled and cooled) enough to make 100 parts. This may be made up by measures as follows: Formalin, 1 pint; salt solution, 2 pints; water, 17 pints.

When made up, the solution will keep indefinitely. Another solution weaker in formalin has also been used here satisfactorily. The proportions are: Formalin, 3 parts; salt solution, 10 parts; water enough to make 100 parts.

For raspberries, the following mixture is recommended: Formalin, 1 part; glycerine, 10 parts; water, 89 parts. Strawberries may be preserved fairly well in a saturated solution of common salt, and, better still, in a fluid composed of formalin, 1 ounce; alum, 1 drachm; glycerine, 5 ounces; water, 3 pints.

Red currants keep best in a solution of corrosive sublimate, 1 part; glycerine, 10 parts; water, 90 parts.

The corrosive sublimate must be dissolved in hot water and the solution and fruit preserved in it should be labeled poison, as it is very deadly if swallowed.

The glass stoppers of bottles and jars may be made perfectly tight

by smearing the ground surface with a small amount of light colored vaseline. This will also prevent, in great measure, the sticking of the stoppers when it is desired to remove them.

CITRUS CROP ESTIMATE.

The following estimate for the citrus crop has been received from G. Harold Powell, manager of the California Fruit Growers' Exchange, under date of November 4, 1913:

The estimates or oranges and lemons made by the Exchange shippers at all of the different shipping points indicate a crop for the State of 38,000 to 40,000 carloads. This estimate would, of course, be changed one way or the other, depending upon climatic conditions from now on. The indications are, however, that there will be about 33,000 or 35,000 cars of oranges and approximately 4,500 cars of lemons. Of the oranges, these preliminary estimates show about 8,000 cars of Valencias and 23,000 to 25,000 cars of Navels. There are usually from 1,500 to 2,000 cars of other varieties of oranges. Of course these estimates are preliminary, but they are based on accurate individual estimates of the growers in the different sections.

SPRAYING TO CONTROL TOMATO THRIPS.

In the report of the Florida Agricultural Experiment Station for 1912, issued March, 1913, pp. 61–62, R. T. Watson has published some interesting things regarding spraying for the tomato or grain thrips, *Euthrips tritici* Fitch. He found that the majority of the tomato blossoms, instead of setting fruit, turned yellow, and if touched dropped off at the node. When these were opened they were found to contain six or more thrips apiece. The pistils and stigmas were attacked. Eggs were found in the style and pedicle, and there was no doubt but that the dropping was caused by the thrips. A trial piece was treated with a spray composed of:

Commercial lime-sulphur (33° Baumé)	5½ gallons
Black-leaf "40"	14 fluid ounces
Water	200 gallons

Seventy-eight per cent of the thrips were killed.—E. O. Essig.

CALENDAR OF INSECT PESTS AND PLANT DISEASES.

By E. J. VOSLER, Assistant Superintendent of the State Insectary.

[Under the above heading the author aims to give brief, popular descriptions and methods of controlling insect pests and plants as near as possible just prior to or at the time when the suggestions given should be carried into effect by the growers.]

KILLING THE SQUASH BUGS.

The squash bug is a brownish-black insect with yellow spots along the edges of the abdomen and has a dirty yellow venter. The young of this bug, which hatch from eggs deposited by the adult in the spring on the early sprouts of squash and pumpkin vines, attack and destroy the young tissues of the plants. As this bug winters over in the adult stage under rubbish and among the old vines, clean culture is important. At this time of the year the burning of all rubbish in the fields, especially the old vines, cleaning along fences and fall plowing, will greatly aid in the reduction of this pest the following year.

INSECTS IN STORED PRODUCTS.

There are many species of insects which do much damage to stored products. Among these can be mentioned the grain weevils, pea weevils, the flower moths, etc. Use carbon bisulphide against these pests, the vapor of which, being heavy, will go downwards, penetrating the stored material to be fumigated. A tight fumigating room is an essential. Pour the carbon bisulphide into shallow dishes and place in the bins, using five pounds to one thousand cubic feet of space. As this fumigant is highly inflammable, caution must be taken that it is not placed near flames. The temperature should be 70° Fahr. or above to insure the best results. Leave products in the room about twenty-four hours.

INSECTS IN GREENHOUSES.

Two pests very troublesome in greenhouses are the red spiders and the mealy bugs. The former cause the affected leaves to turn yellow and drop. They are noticed as small reddish dots on the under sides of the leaves. Syringing the plants forcibly with water two or three times a week, care being taken to reach the undersides of the leaves, will usually suffice to keep this mite under control. The mealy bugs are probably the hardest pests to fight in the greenhouse. Syringing, as used against the red spider, is the most practical remedy, but will be effective against the younger stages only.

THE FRUIT TREE LEAF-ROLLER.

The larvæ of the fruit tree leaf-roller injure the blossoms and destroy the fruit and foliage of many species of plants, including apple, pear, plum, cherry, apricot, quince, peach, rose, currant, raspberry and gooseberry. This insect passes the winter in the egg stage. The egg masses are made up of from ten to one hundred and fifty eggs covered with a sticky substance deposited with the egg. They are laid most anywhere

on the bark of shade trees, fruit trees, shrubbery and berry bushes.[1] George P. Weldon recommends the use of soluble oils used in proportions not weaker than one gallon of soluble oil to nineteen gallons of water as a winter spray to destroy the egg masses of this pest.

THE CALIFORNIA TUSSOCK MOTH.

The caterpillars of this moth are gray in color with numerous colored spots. They have four prominent white tufts on the dorsum and two distinct black ones on the head. They feed upon the young fruit and foliage. As this pest spends the winter in the egg stage, the hand picking of the egg masses after the leaves have fallen will greatly reduce their numbers. The egg masses are attached to the trunks of trees and to nearby objects or to twigs.

PEAR BLIGHT.

The damage wrought by pear blight and the appearance of affected trees are too well known for comment in this article. Suffice it to say that during the winter months the orchard should be carefully gone over and the diseased portion of the trees cut off and burned before the blooming season commences. The prunning tools and the cuts must be disinfected with corrosive sublimate 1 to 1000. Care must be taken to cut off below any sign of the visibly infected area. If after this treatment blight appears during the growing season, the work of cutting out infested areas must be continued.

SMUT OF WHEAT, OATS AND BARLEY.

The smut of grains causes large losses annually to the agriculturist in the United States. Sprinkle the grain thoroughly with formalin, 1 pint to 30 gallons of water, and allow the seed to dry before sowing.

[1]Mo. Bul. Cal. State Com. of Hort., Vol. 2, No. 9, p. 645.

INSECT NOTES.

Conducted by the Editor.

Mr. C. W. Beers, of Santa Barbara, reports a **millipede** doing considerable damage to the tender roots of vines in his county. Mr. B. R. Jones also reports this worm and has sent in specimens of lettuce heads from Los Angeles County which are badly damaged by this millipede. These worms are more commonly called the thousand-legged worms, and are, for the most part, considered harmless, feeding largely upon decaying vegetable matter and only occasionally attacking living roots.—LEROY CHILDS.

From Philo, Mendocino County, Cal., comes the report that the **dark blue blister beetle,** *Cantharis stygica* Lec., is doing considerable damage to buds and blossoms of asters, completely ruining them in many instances.—LEROY CHILDS.

The red-humped caterpillar, *Schizura concinna* S & A, has been reported attacking the foliage of apples, prunes, cherries, pears and walnuts at Modesto.—LEROY CHILDS.

A very curious insect has been reported from Los Angeles, parasitic upon pigeons. It proves to be one of the little known parasitic flies belonging to the family *Hippoboscidæ*, and is reported as annoying the birds very much. These insects occur occasionally on wild birds, such as owls, partridges and quail, but to the writer's knowledge have never been reported as annoying any domestic fowls.—LEROY CHILDS.

Currant and gooseberry fruit fly, *Epochra canadensis* Lœw., was received from Geo. A. Lamiman, Anderson, Shasta County, Cal., September 29, 1913.

The walnut scale, *Aspidiotus juglans-regiæ* Comst., has been recorded as present on walnut trees in the Anaheim section of Orange County by Roy K. Bishop, who states that limbs are evidently killed by it.

Black scale, *Saissetia oleæ* Bern., badly infesting watermelon vines, have been sent in by Roy K. Bishop, and with them the following data: "These vines were raised between two rows of 3-year-old orange trees. Infestation began June 15th, the black scale hatching at that time. The scale have come to maturity in four months on the watermelon vines, yet on orange trees it is very hard to find living scale, and those found are still very small. Note how much faster they grow on the melon vines than on orange trees." A similar condition was observed by the writer at Santa Paula in 1910. In this instance the melons were also infested. On many succulent plants, such as nightshade, geranium, ivy and melon vines, this scale matures in a very short time.

Mr. R. S. Vaile has recently reared from *Aspidiotus hederæ* Vall., *Aspidiotiphagus citrinus* Craw., and *Aphelinus fuscipennis* Howard, which were kindly determined by Dr. L. O. Howard. This is the first time, to our knowledge, that these parasites have been recorded as working on this scale insect.—E. J. VOSLER.

Chelonus shoshoneanorum Vier., is the name of a parasite reared by Mr. H. A. Weinland, of San Diego County, from the potato tuber moth, *Phthorimæa operculella* Zeller. This parasite was determined by Mr. P. R. Myers of the National Museum through the kindness of Dr. F. H. Chittenden of the U. S. Bureau of Entomology.—E. J. VOSLER.

The State Insectary has just received two lots of mealy bug parasites from Japan through the kindness of Mr. S. I. Kuwana, Entomologist of the Imperial Agricultural Experiment Station, Tokio, Japan.—E. J. VOSLER.

Harry S. Smith, Superintendent of the State Insectary, is now in the Philippine Islands collecting parasites of the black scale and the citrus mealy bug. He recently sent over a fine lot of black scale parasites from this locality.—E. J. VOSLER.

The State Insectary is greatly indebted to Mr. C. H. T. Townsend, director of the Peruvian Entomological Stations, for a colony of black scale parasites.—E. J. VOSLER.

NOTES FROM THE COUNTY COMMISSIONERS

By Geo. P. Weldon, Chief Deputy State Commissioner of Horticulture.

Imperial County.

Mr. F. W. Waite has been appointed Horticultural Commissioner for Imperial County to succeed Mr. W. E. Wilsie, who resently resigned.

Humboldt County.

Humboldt County's resources were splendidly advertised by County Horticultural Commissioner George Weatherby at the California Apple Show recently held at Watsonville. Mr. Weatherby is alive to the opportunities as well as the needs of his county, and is to be commended for the splendid display of products that was made.

Santa Barbara County.

In authorizing County Horticultural Commissioner C. W. Beers to purchase a good power sprayer to use in his work, the board of supervisors of Santa Barbara County are setting a good example for other counties, whose commissioners have no facility for spraying, to follow. Lack of equipment is a serious handicap in field work, and nothing can be put to more practical use than a good spray outfit.

Messrs. Marchbank, Schulz, Schell, Morris, Sharp and Stabler represented their respective counties at the State Nurserymen's Convention held in Fresno recently. The three first mentioned took part in the program.

QUARANTINE DIVISION.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, California.

The real battle of the human species for the possession and enjoyment of the earth has resolved itself into a universal continuous fight against insect pests. In Continental as well as Island America, the medicos are having a never-ending conflict with mosquitoes, flies and bacilli. The work and triumphs of the sanitary officers in the canal zone are almost equal to those of the engineering staff. The Marine Health Service is constantly at war with the rats and squirrels, but the prime purpose of the combat is directed against the disease-bearing insects that infest these rodents. The world-wide inspection for and control measures against cattle ticks is maintained as much, if not more, in hopes of reducing the ultimate cost of shoes than to augment the comfort of the animal that wears the hide, while the boll-weevil influences the cost of calico in common with the operations of the speculators in cotton futures. If the maggot fly pest of sheep could be eliminated from the flocks of the world, the fabric most in vogue among the proletariate would be all wool and a yard wide, rather than shoddy, and the mysteries of schedule K would probably cease to be of interest.

In our own particular domain we are concerned principally with the insects and diseases hostile to the maximum production of food plants—especially the fruit-flies—and the strict administration of such laws and regulations as provided for their exclusion from the fields and orchards of California by the State and Federal governments. This, in itself, is an undertaking that demands eternal vigilance at our maritime ports of entry with the ever-increasing commerce from the ports of Oceanica and those of the Orient and Central America. But we have not overlooked the importance of the interior points open to the entrance of these pests, and have hopes of ultimately unifying both the system and methods of applying all the provisions of the state quarantine law in the matter of horticultural imports throughout the entire State.

REPORT FOR MONTH OF SEPTEMBER, 1913.

SAN FRANCISCO STATION.

Horticultural imports.

		Parcels.
Ships inspected	41	
Passed as free from pests		61,530
Fumigated		1,848
Destroyed or returned		200
Contraband destroyed		21
Total parcels horticultural products for the month		63,599

Horticultural exports.

	Parcels.
Inspected and certified	4,004

Pests Intercepted.

From Honolulu—
Live larvæ of *Dacus cucurbitæ* in cucumbers.
Live larvæ of *Ceratitis capitata* in string beans.
Cryptorhynchus batatæ and lepidopterous larvæ in sweet potatoes.
Diaspis bromeliæ and *Saissetia nigra* on pineapple slips.
Coccus hesperidum and *Saissetia nigra* on betel leaves.
Pseudococcus sp. and *Diaspis bromeliæ* on pineapples.

From China—
Pseudaonidia trilobitiformis, Chionaspis citri, Lepidosaphes beckii and *Phomopsis citri* on pomelos.

From New Zealand—
Chionaspis sp. on fronds of Tree ferns.

From Tahiti—
Morganella maskelli on oranges.

From Mexico—
Chrysomphalus aurantii and *Lepidosaphes gloverii* on limes.
Tetraprioccra longicornis, Amphicerus punctipennis and *Scolytidæ* sp. in material used as crates for panoche.

From Corinto—
Ant sp. on orchids.

From Philadelphia—
Aspidiotus latania, Pseudococcus citri, Chrysomphalus aonidum and larvæ of *Thrips* sp. on palms.

From New York—
Diaspis boisduvalii on orchids.

LOS ANGELES STATION.

Horticultural imports.

	Parcels.
Ships inspected	22
Passed as free from pests	16,251
Fumigated	5
Destroyed	0
Returned	0
Contraband	0
Total parcels horticultural products for the month	16,256

Pests Intercepted.

From Florida—
Chrysomphalus aurantii, Coccus hesperidum and *Parlatoria* sp. on mango trees.

From New Jersey—
Parlatoria pergandii on crotons.
Saissetia hemisphærica on ferns.

From Pennsylvania—
Chrysomphalus aurantii on palms.
Coccus longulus and *Parlatoria* sp. on crotons.

SAN DIEGO STATION.

Horticultural imports.

	Parcels.
Ships inspected	23
Passed as free from pests	2,124
Fumigated	3
Destroyed	0
Returned	0
Contraband	8
Total parcels horticultural products for the month	2,135

Pests Intercepted.

From Arizona—
Bruchus sp. in "screw-beans."

From New York—
Monophadnoides rubi in black raspberry canes.

SANTA BARBARA STATION.

Ships inspected 1
No horticultural imports.

EUREKA STATION.

Ships inspected 4
No horticultural imports.

UNIFORM HORTICULTURAL LAWS.

By Frederick Maskew.

During the past month a number of earnest men have again been striving to bring about a system of uniform horticultural laws. The writer of this was not present in this instance, but it has been his fortune to have attended many such meetings during the past sixteen years, at all of which much time, thought and discussion were devoted to this same subject, yet little of a positive satisfactory nature was accomplished. During all of this same period we have been almost daily engaged in putting into execution the provisions of such horticultural laws and regulations as were in force at the time, and have of a necessity given much thought to the matter. As a result of this, it is our opinion that the principal barrier to success is the ambiguous nature of the certificates of inspection issued. When those interested in this much needed standardization of interstate horticultural regulations can bring it about that each certificate of inspection covering a consignment of horticultural material shall be virtually an affidavit of known facts and not a supposition, the foundation will have been soundly laid, and the superstructure of design, acceptance, respect and uniformity of interstate horticultural regulations will quickly follow.

Under the conditions that prevail in many of our states at the present time, it is a physical impossibility to conduct the inspection in such a manner as to make certificates of inspection acceptable at their face value in California. To go into the details of why this is so would fill this volume; suffice it to say, the true cause at the present time is the inadequate inspection force employed. The men composing the horticultural inspection service in California are endowed with robust minds. They look at the fundamental principle underlying this inspection work in a practical utilitarian spirit and with a full realization of the equity of every phase of the situation. The numerical strength of the combined State and county inspection force in California makes possible a thoroughness not obtainable in many other localities, and as a result creates a feeling of disgust for fictitious or fallacious statements of inspection. It is our opinion that the true cause for this feeling must be permanently removed before a full measure of support and co-operation in constructive legislation upon these matters can be obtained from the rank and file of the horticultural inspection service of the State of California.

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